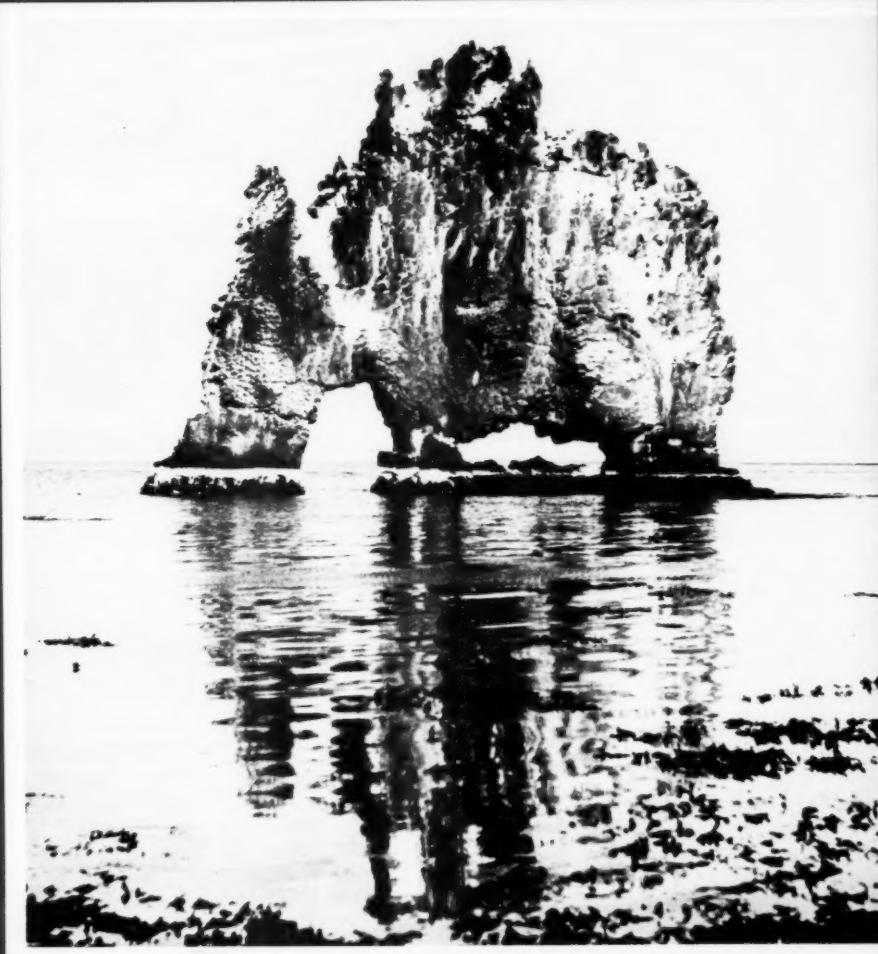


GEOTIMES

Professional News Magazine



March, 1961

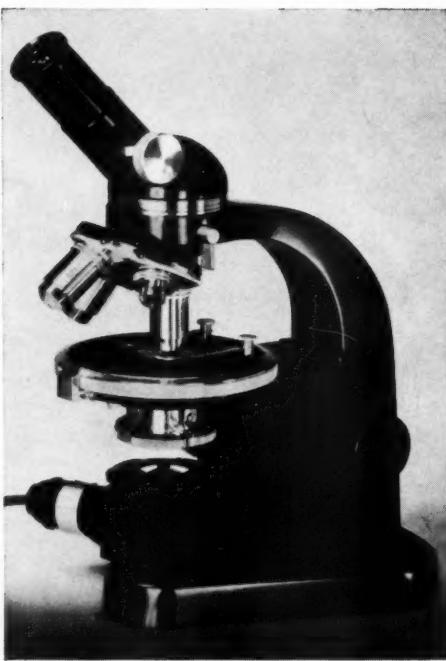
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Calendar

Cooperation of Society Secretaries in supplying meeting notices for GEOTIMES calendar is requested.

Mar. 20-26, 1960—ACSM-ASP: Annual Meeting, Shoreham Hotel, Washington, D. C.

*Mar. 24-26, 1960—GSA: Southeastern Section meeting, sponsored jointly by Univ. of Kentucky Geol. Dept., Kentucky Geol. Survey, and Kentucky Geol. Soc., Lexington, Ky. Field trips (2) on third day. Write: Thomas G. Roberts, Dept. of Geol., Univ. of Ky., Lexington, Ky. Guidebook.

April 1-2, 1960—ALABAMA ACAD. OF SCIENCE, Geol. & Anthropol. Sect., Huntsville, Alabama.

April 3-5, 1960—SEGP: 13th Ann. Midwestern Exploration Meeting, Capt. Shreve and Washington-Yourres Hotels, Shreveport. Write: S. R. Marsh, The Carter Oil Co., Dr. 1739, Shreveport, La.

April 3-8, 1960—ENGINEERS JOINT COUNCIL, 6th Nuclear Congress, New York. Write: Council, 29 W. 39th St., New York 18.

April 5-14, 1960—AMER. CHEM. SOC., 137th Meeting, Cleveland, Ohio.

April 7-9, 1960—OPTICAL SOC. OF AMERICA, Hotel Statler, Washington, D. C.

April 11-13, 1960—AIME: Fifth Ann. Mining, Minerals and Petroleum Conf., Univ. of Alaska, College, Alaska. Principal speakers, Dr. James Boyd, V.P. Kennecott Copper Corp., and Dr. Joseph Gillson, 1960 Pres., AIME. Write: Alaska Sect., AIME, Box 4001, College, Alaska.

April 14-15, 1960—LAKE SUPERIOR INSTITUTE OF GEOLOGY, 6th Ann. Meeting, sponsored jointly by UW dept. of geology and the Wisc. Geol. and Nat. Hist. Survey, Univ. of Wisconsin campus, Madison. Write: E. N. Cameron, Science Hall, Univ. of Wisconsin, Madison.

*April 14-16, 1960—SEPM: Permian Basin Sect., Ann. Meeting, April 14, Abilene, Texas. Field conf. to study Pennsylvanian and L. Permian, April 15, 16. Write: J. P. Brand, Texas Tech. Coll., Lubbock.

April 20-21, 1960—MUSKEG RESEARCH CONFERENCE 6th Ann. Meeting, sponsored by Assoc. Comm. on Soil and Snow Mechanics of the NRC of Canada, Calgary, Alta. Write: I. C. McFarlane, c/o Div. of Bldg. Research, Nat. Res. Council, Ottawa 2, Canada.

GEOTIMES CALENDAR

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April 21-22, 1960—AIME: Southwest Metals & Minerals Conf., Ambassador Hotel, Los Angeles, Calif.

*April 21-22, 1960—NEW MEXICO GEOL. SOC., Spring Meeting, April 22, Socorro, N.M. Informal field trips in central N.M. April 23. Write: Society, Campus Station, Socorro, N. Mex.

*April 22-23, 1960—OHIO ACAD. OF SCIENCE, Geol. Sect., meeting, Antioch College, Yellow Springs, Ohio. Field trip April 23.

April 22-23, 1960—AASG: Pennsylvania Geol. Survey, Harrisburg, Pa.

April 24-28, 1960—ACerS: 62nd Annual Meeting, Bellevue-Stratford Hotel, Philadelphia. April 25-27, 1960—CIM Ann. Mtg., Royal York Hotel, Toronto, Canada.

*April 25-28, 1960—AAPG-SEPM: Ann. Meeting, Chalfonte-Haddon Hall, Atlantic City. Four field trips: N. J. Coastal Plain, Apr. 23-24 (\$1); South Mt., Md., Apr. 23-24 (\$37); Carbonate Rocks, Md. & Penn., Apr. 22-24 (\$55); Shenandoah Valley, Va., Apr. 22-24 (\$67). Write: R. B. Neuman, Rm. 337, U.S. Nat. Museum, Washington 25, D. C. Guidebook.

*April 28-30—GSA: Rocky Mountain Sect. Re-Washington, D. C. This date is tentative.

*April 27-30—GSA: Rocky Mountain Sect. Regional Meeting, School of Mines & Tech., Rapid City, S. D. Trips to Black Hills, White River Badlands, Keystone area and Homestake Mine to study Precambrian, Paleozoic and Mesozoic of areas. Write: E. L. Tullis, S. Dak. School of Mines, Rapid City, S. D. Guidebook.

*April 28-30, 1960—AIME: 13th Ann. Pacific NW Metals and Minerals Conf., Sheraton Hotel, Portland, Ore. Field trips.

April 29-30, 1960—MISSISSIPPI ACAD. OF SCIENCES, Inc., Millsaps College, Jackson, Miss. Write: Dr. C. Q. Sheely, Miss. State Univ., State College, Miss.

April 30, 1960—IDAHO ACAD. OF SCIENCE, second ann. meeting and phosphate symposium. Guest lecturer: Dr. Harlow Shapley. Idaho State College, Pocatello. Write: A. E. Taylor, I.S.C.

May 2-3, 1960—AIME: SOC. PET. ENGNRS., 4th Biennial N. Texas Secondary Recovery Symposium, Wichita Falls, Texas.

May 5-6, 1960—AIME: Ann. Joint Meeting, Rocky Mountain Petr. Sects., Calgary, Alta.

*May 5-10, 1960—GSA: Cordilleran Sect., Vancouver, British Columbia. Road log trips from Vancouver to Squamish, Fraser Canyon, Tex-



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May 6-7, 1960—SSA: Vancouver, B. C., Canada.

May 14-15, 1960—MIDWEST FRIENDS OF THE PLEISTOCENE, Ann. Meeting, Eastern South Dakota. Write: Allen F. Agnew, State Geologist, South Dakota Geological Survey, Vermillion.

*May 25-28, 1960—AAPG: Western Canada Regional Meeting with Alberta Soc. of Petr. Geol. as host, Banff Springs Hotel, Banff, Alta. May 28, trips from Banff to Golden, B. C., and to Minnewanka-Canmore area to study structure of Rocky Mtns. and Devonian, Mississippian and Lower Mesozoic of Banff area. Write: G. G. L. Henderson, Calif. Standard, Medical Arts Bldg., Calgary, Alta., Canada. Maps and Notes.

June 20-23, 1960—CANADIAN SOIL SCIENCE SOC., Ann. Meeting, Guelph, Ont., Canada.

July 25-Aug. 6, 1960—IUGG: General Assembly, Helsinki, Finland. Inquire: Sec. Gen. G. Laclavere, 30 Avenue Rapp, Paris 7, France.

*Aug. 6-12, 1960—19TH INTERNATIONAL GEOGRAPHIC CONGRESS, General Assembly of the IGU and meetings of the IGU Commission, Stockholm, Sweden. Inquire: The International Geographic Congress Postfack Stockholm 6, Sweden.

Aug. 14-24, 1960—7TH INTERNAT. CONGRESS OF SOIL SCIENCE, Madison, Wis.

*Aug. 15-25, 1960—XXI INTERNATIONAL GEOLOGICAL CONGRESS, to be held at the Mineralogical Geological Museum of the University of Copenhagen in Denmark. Field trips before and after the meetings.

Aug. 20-25, 1960—INTERNAT. MINERAL. AS-SOC., 2nd General Meeting; Mineralogical Museum, Univ. of Copenhagen, Denmark.

Sept. 11-16, 1960—AMER. CHEM. SOC., 138th Meeting, New York City.

Oct. 2-5, 1960—AIME: Soc. of Petr. Eng., Fall meeting, Denver.

Oct. 5-7, 1960—AIME: Rocky Mountain Minerals Conf., Newhouse Hotel, Salt Lake City, Utah.

Oct. 6-8, 1960—9TH NATIONAL CLAY CONF., Purdue Univ., Lafayette, Ind. Write: J. L. White, Agronomy Dept., Purdue Univ.

Oct. 12-14, 1960—AAPG: SW Fed. of Geological Soc's, 3rd Ann. Meeting, Abilene, Texas.

Oct. 13-15, 1960—OPTICAL SOC. OF AMERICA, Somerset Hotel, Boston, Mass.

Oct. 18-21, 1960—ACERS: 13th Pacific Coast Regional Meeting, Ambassador Hotel, Los Angeles, Calif.

*Oct. 19-21, 1960—GULF COAST ASSOC. OF GEOL. SOC'S, 10th Ann. Convention, Buena Vista Hotel, Biloxi, Miss. Host: Miss. Geol. Soc. Theme: "The Future of Gulf Coast Oil." Technical sessions, entertainment and post meeting field trip. Write: A. E. Blanton, Gen. Chrmn., P. O. Box 422, Jackson, Miss.

Oct. 20-21, 1960—AIME: Los Angeles Basin Sect., Fall Meeting, Huntington Sheraton Hotel, Pasadena, Calif.

*Oct. 31-Nov. 3, 1960—GSA: Ann. Meeting, in conjunction with PS, MSA, GS, SVP and SEEG, Denver Hilton Hotel, Denver, Colo. Field trips before and after the meetings, also local excursions. Write: E. D. McKee, U.S. Geol. Survey, Federal Center, Denver, Colo.

Nov. 7-10, 1960—SEGP: 30th Ann. Internat. meeting, Moody Convention Center, Galveston. Write: W. B. Lee, Jr., Gulf Oil Corp., Dr. 2100, Houston 1, Tex.

Dec. 26-31, 1960—AAAS, Annual Meeting, New York City.

1960 SCHEDULE OF FIELD TRIPS

For additional field trips held in conjunction with meetings, see those items marked with an asterisk under meeting calendar.

March 31-April 2—SHREVEPORT GEOLOGICAL SOC., trip to southern Sabine Uplift and Rayburn, Prothro and other salt domes to study Tertiary; Write: J. K. Rogers, Ark. Fuel Oil Corp., Box 1117, Shreveport, La. Guidebook.

April 13-17—SEG: KANSAS STATE CHAPTER, trip to Arbuckle Mountains to study structure and economics. Write: Henry Beck, Kansas State Univ., Manhattan, Kans. Guidebook.

April 15-16—SEPM: Pacific Coast Sect., Ann. Spring Field Trip, Panoche Hills, Calif. Dinner meeting at The Hacienda, Fresno, Calif. Write: R. L. Brooks, 5900 Cherry Ave., Long Beach 5, Calif. Guidebook.

April 15-16—SEPM: PERMIAN BASIN SECTION, trip to Bend Arch area of Eastland and Stephens Counties to study problems of Canyon and Cisco of Upper Penn. Write: Thomas Hambleton, Box 1270, Midland, Texas. Guidebook.

April 16—ILLINOIS STATE GEOL. SURVEY, trip to Marion Co., Ill. to study surface Pleistocene, Omeza ls., and some oil fields. Write: George M. Wilson, Ill. St. Geol. Survey, Nat. Resources Bldg., Urbana, Ill. Guidebook.

FIELD TRIP CALENDAR

Most of the information regarding field trips in this calendar appears through the courtesy and cooperation of the AAPG Field Trip Committee. Corrections, additions and new trip notices should be sent to George H. Fenner, Chairman, AAPG Field Trip Committee, P. O. Box 2585, Denver 1, Colo., with a carbon copy to GeoTimes Calendar, American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D. C.

April 23—ILLINOIS STATE ACAD. OF SCIENCE, trip to Mississippi R. bluffs to study Classic Mississippian System outcrops. Write: Academy at Quincy College, Quincy, Ill.

April 23-May 1—MISSISSIPPI GEOLOGICAL SOC., & SEPM-GULF COAST SECT., trip to coastal Mississippi and SW Alabama to study Recent marine sediments and Cenozoic. Write: F. X. Bland, California Co., Box 822, Jackson, Miss. Guidebook.

April 29-30—CORPUS CHRISTI GEOL. SOC., Ann. Field Trip, Maverick and Val Verde Counties, Texas. Write: L. Joe Sockwell, Sun Oil Co., Box 2431, Corpus Christi, Tex.

May 7—ILLINOIS STATE GEOL. SURVEY, trip to Jersey Co., Ill. to study Can au Gras fold and history of Ill. and Miss. R. valleys. Write: George M. Wilson, Survey, Urbana, Ill. Guidebook.

May 10?—NEW YORK STATE GEOL. ASSOC., trip to Central New York in vicinity of Clinton to study stratigraphy, paleontology and geomorphology, largely Paleozoic. Write: Dr. David Hawley, Hamilton College, Clinton, N.Y. Guidebook.

May 15?—HOUSTON GEOL. SOC., trip probably to Grimes Co., Texas to study Miocene outcrops. Write: Society, 234 Esperon Bldg., Houston, Texas. Guidebook.

May 20?—FIELD CONF. OF PENNSYLVANIAN GEOLOGISTS, trip to SE Penna. to study Piedmont Paleozoic of Triassic lowlands. Write: M. N. Shaffner, Bur. Topo. & Geol. Survey, Harrisburg, Pa.

May 21—ILLINOIS STATE GEOL. SURVEY, trip to McHenry Co., Ill. to study glacial features of Wisconsin and Ordovician and Silurian rocks. Write: George M. Wilson, Survey, Urbana, Ill. Guidebook.

Aug. 3-5—WYOMING GEOL. ASSOC., trip to Big Piney-LaBarge area, Snyder Basin and Wind River Mtns. to study geology of westernmost Wyoming overthrust belt. Write: C. A. Burk, Box 1331, Casper, Wyo. Guidebook.

Sept. 9-10—FRIENDS OF THE PLEISTOCENE, field trips at Promontory Point (SP Railroad) gravel pit in Little Cottonwood Creek area (20 mi S of Salt Lake City), Lake Bonneville stratigraphy and correlations with glacial units. Write: R. B. Morrison, U.S.G.S., Federal Center, Denver, Colo., or H. D. Goode, U.S.G.S., 503 Federal Bldg., Salt Lake City, Utah.

This Month in **GEO TIMES**



Professional News Magazine

Published by THE AMERICAN GEOLOGICAL INSTITUTE

Robert C. Stephenson,
EDITOR

Kathryn Lohman
CIRCULATION MANAGER

VOL. IV, No. 6

MARCH 1960

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Against this inevitable tide of fragmentation of the geosciences, the American Geological Institute stands as the potential organization to coordinate the common interests of the ever-fragmenting scientific groups and preserve the identity of the geologist and solid earth geophysicists as the professional scientists concerned with broader aspects of the science of the solid earth.

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OUR COVER

A spectacular stack in one of the bays on the North Coast of Iceland. Photo by courtesy of the Icelandic Consulate, Washington, D.C.

The AMERICAN GEOLOGICAL INSTITUTE is a non-profit professional service organization established and managed by the scientific societies in the fields of geology and geophysics in cooperation with the National Academy of Sciences-National Research Council. It is the instrument of the profession serving and advancing the welfare of the geoscientist in matters relating to education, professional responsibilities and government relations. It is an active member of the Scientific Manpower Commission. It also functions in the stimulation of public education and awareness of the earth sciences, through career literature, the scouting program and other channels of communication.

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GEOLOGY IN ICELAND

by S. THORARINSSON and T. TRYGGVASON

Iceland lies in the centre of the Thulean basaltic province, and has been built up by igneous activity. The oldest parts of the country are of early Tertiary age, and in some parts volcanic activity is still going on.

The basalts have been divided into two stratigraphic series: the *Tertiary* or the *Regional basaltic series* constitutes an integral part of the Thulean plateau- or flood-basalts in general, whereas the *Insular* basaltic series is built up by Pleistocene and Recent volcanic activity limited to Iceland and Jan Mayen.

The Tertiary series has built up in the eastern, western and the northwestern parts of the country, whereas a broad median zone running from Mælarrakasléttá in the north to Reykjanes in the southwest, as well as the Snæfellsnes peninsula, is covered with Pleistocene eruptive products and post-Glacial lava flows.

The Tertiary basalt areas are characterized by their regular structure. Generally they were built up by nearly horizontal lava beds, separated by layers of clastic material, red in color and of clayey consistency. These interlayers generally represent the alteration product of tephra, that is ash and other pyroclastic ejecta, and often preserve the original texture. Commonly these interlayers are less than a foot in thickness, but others may be several yards thick, and sometimes contain lignite or petrified wood along with an abundance of leaf impressions and pollen. The thin interlayers indicate short intervals between lava flows, whereas the thick ones represent longer intervals or periods of rest in the volcanic activity. Remnants of animals have never been found in the Tertiary basalts of Iceland.

Acid rocks cover less than one per cent of the country's surface. Rhyolites are most common, but granophyres and granites are rare. The largest acidic areas are found in the Tertiary series in the eastern and southeastern part of the country, while in the west they are less common. However, the best known rhyolitic mountain in Iceland, Baula, is situated in the Borgarfjördur Area in the west, near the

main road leading from Reykjavík to the north. In general, the rhyolitic complexes in the Tertiary series are accompanied by layers of ignimbrite.

Natural heat is one of the geological characteristics of Iceland, and is manifested in an unsurpassed multitude of phenomena. The temperature of the hot springs covers the scale from that of a normal groundwater to superheated steam, and the quantity varies from the just perceptible to a flow of 3-5 thousand gal./min. The Great Geysir is the most famous of all hot springs in Iceland, and has given name to all eruptive hot springs in the world.

The terrestrial hot water does not indicate a direct connection to the young volcanism, even though it is most abundant in the areas of the Pleistocene and post-Glacial activity. The hot water is really the circulating ground water following tectonic fissures and permeable layers at various depths, taking up the terrestrial heat and appearing at the surface in limited areas as hot springs and solfataras. However, drillings have shown that, at least in the south-west of Iceland, the geothermal gradient is ca: 3 times as high

This article is the fourth in a series of five on geology and geologists of the Nordic countries that will be hosts to the geologists of the world attending the XXI International Geological Congress, Copenhagen, August 15-25, 1960. See *GeoTimes* October 1959 (Sweden), Nov.-Dec. 1959 (Norway), Jan.-Feb. 1960 (Finland).

as in the continents of Europe and America. The Tertiary areas of the west and northwest are the site of considerable thermal activity, whereas thermal springs are very rare in the Tertiary series of the east. There, however, a secondary mineralization is found in many places, indicating geothermal activity in the past history of that area.

GEOTHERMAL ENERGY

In the last decades the geothermal energy has been taken into the service of the people on an increasing scale. The capital of Iceland is located on an area of hot springs, and another such area of large thermal flow lies about 15 miles east of the town. The heat transfer of the hot springs in these areas has been manifolded by drillings, and now the apartments of 40-50 thousand people in Reykjavik are heated by this water. Besides this, some minor towns, villages, farm houses and green houses lying in "hot areas" utilize the terrestrial heat.

Collaboration of ice and fire is the characteristic feature of the Pleistocene in Iceland. The Palagonite formation, named after basic tuffs which constitute its bulk, includes all rocks formed during the Glacial period with its interglacials and covers a wide range of different rocks both igneous and sedimentary. The basic tuffs which consist predominantly of basic glass sideromelane, are considered to originate from subglacial or through-glacial eruptions. This conception is supported by the fact that the tuffs often include beds of pillow lavas, and that these tuffs indicate more violent explosions than is considered normal for subaerial basaltic eruptions.

The Pleistocene volcanism has given rise to a broad variety of landscape forms, the most typical of which are table mountains and tuff ridges.

The last one or two of the Interglacial periods in Iceland are characterized by coarse grained basalts, the dolerites, which were poured out of shield-volcanoes in large quantities. This type of volcanism continued into post-Glacial time, but in

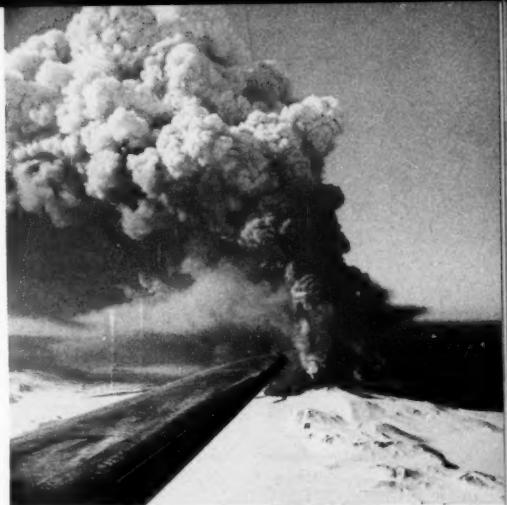


Figure 1. A cloud column rises about 30,000 feet over Hekla on March 29, 1947. Photo by Vigfus Sigurgeirsson.

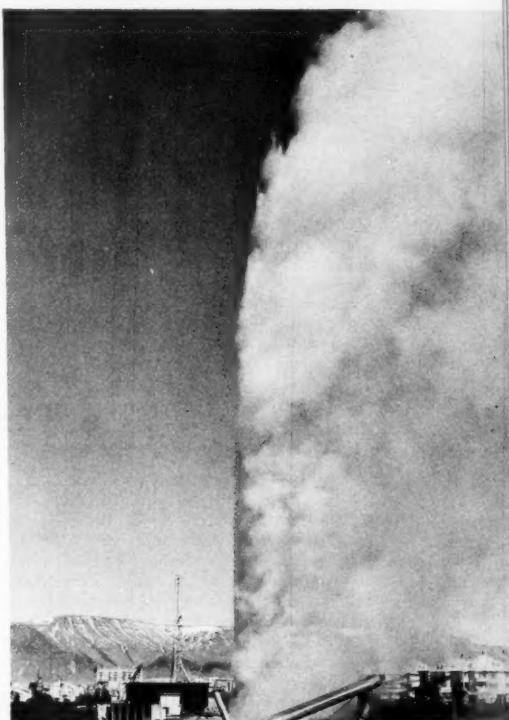


Figure 2. A hot water well within the city of Reykjavik produces 100 tons of water per hour with a temperature of 130° C. The well is 2500 feet deep and has a bottom hole diameter of 8 1/4 inches. Photo by Gunna Runar.



Wave-like structures may be observed in this recent lava flow in the South of Iceland. Photo by E. Sigurgeirsson.

historical time no shield-volcanoes have been active in Iceland.

The recent volcanism is mainly effusive, producing a great amount of basalt lava. The volcanoes most typical of Iceland are crater rows such as the famous Lakiagigar; but on the whole the Icelandic volcanoes represent nearly every existing type, from purely effusive fissures to purely explosive maars.

The strato-volcanoes of the Fuji-type are not common but to them belong the biggest volcanic edifices. The most famous of the Icelandic volcanoes, Hekla, is a strato-volcano built on a fissure. Both Hekla and the other big strato-volcanoes in Iceland in post-Glacial time have had one or more acid explosive outbursts occurring after long intervals of quiescence. The most extensive tephra-layers in the post-glacial soils are the rhyolitic ones. Some of these layers have been dated with the aid of historical records, others by C^{14} , and these dated layers are of great help for a quantitative study of geomorphological processes such as glacial, fluvial and wind erosion and the study of the post-Glacial changes of climate and vegetation.

Few countries offer as excellent opportunities as Iceland for the study of geomorphological processes. It is really an Eldorado for all who wish to study the forces that have formed and still are forming the face of the earth. There they are so active and their effects are so clearly to be seen that anyone who has eyes to see must understand them. There are Icelandic peasants who have never read a book about geology and geomorphology and yet, without realizing it, know so much about these things that many a professional geologist might envy them. The countryside around them was their only teacher. Not without reason it has been claimed that "no other country illustrates so completely within its borders

the geological dictum that the present is the key to the past".

GEOLOGIC PROBLEMS MANY

Iceland is a country with many geological problems—and few geologists. The University of Iceland has no chair in geology, but two geologists are working in the University Research Institute. Two are working at the Department of Geology of the Museum of Natural History and two at the Department for Natural Heat. The total number of geologists in the country is less than ten. Since the early 19th century Iceland has been visited by numerous foreign geologists, some of whom have contributed much to our knowledge of its geology. Many of the visits of foreign geologists, however, have been too limited in space and time to allow any thorough studies and such visits have often resulted in papers of a very limited value.

The last few decades have changed much in Iceland. One of the most important changes is that manufacturing which hardly existed in the country at the beginning of our century has risen to the first rank among the occupations of the Icelanders. This has led to a steadily increasing demand for energy and this demand has in its turn resulted in rapidly increasing geotechnical and geophysical research work, especially in connection with the development of hydroelectric and geothermal power. The future of the Icelandic people depends greatly on a successful development of our great power resources but one of the main conditions precedent for such a development is an improved knowledge of the geology of the country, won by intensified and combined geological and geophysical research. We may thus expect or at least hope that the demand for Icelandic geologists will increase considerably in the nearest future. It may also be expected that with improved communications our country will, on an increasing scale, attract geologists from all over the world, simply because the country is in itself so stimulating from a geological point of view that no geologist has hitherto regretted a visit to Iceland.

EDITOR'S NOTE

The article "GEOLOGY IN NORWAY," GeoTimes Vol. IV, No. 4, was written by *Chr. Oftedahl*, Geologisk Institutt, Norges Tekniske Høyskole, Trondheim, and *J. A. Dons*, Geologisk Museum, Oslo. Due to an unfortunate error in the original manuscript Professor Oftedahl's name was omitted.

a report on

GEOSCIENCE ABSTRACTS

In January 1959 the American Geological Institute undertook the publication of GeoScience Abstracts, aided by an initial working capital grant from the National Science Foundation. GeoScience Abstracts, with a completely new format, replaced Geological Abstracts which had been published by the Geological Society of America for the Member Societies of the American Geological Institute.

The new journal, GeoScience Abstracts, stepped up publication from a quarterly to a monthly basis. In the first twelve issues (Volume I, 1959) the new journal published 3202 abstracts from 417 sources as compared with 1559 abstracts from 49 sources published in Geological Abstracts in 1958. An index to Volume I will be issued in March and distributed to all Volume I subscribers.

By the end of its first volume year GeoScience Abstracts had the following subscribers in each of the three subscription groups.

<i>Individuals</i>	787
<i>Education and Public Libraries</i>	322
<i>Government and Private Users</i>	139
TOTAL	1,248

Credit for organization and development of the new journal goes primarily to Miss Anne C. Sangree aided by Martin Russell, Manager of AGI Technical Publications. Miss Lois Dane joined the GeoScience Abstracts staff in June 1959 as assistant to Miss Sangree. Preparation of offset copy has been under the direction of Mrs. Nellie Brown, who is in charge of the AGI technical publications copy preparation unit.

INDEX TO VOLUME I

The Index to Volume I will be issued to all Vol. I subscribers on or before April 15.

TRIAL COPY

You may obtain a trial copy of *GEOSCIENCE ABSTRACTS* by sending \$0.50 to AGI to cover postage and handling.

Following is a summary of the number of abstracts, published in each of the fifteen subject sections of GeoScience Abstracts:

SECTION	ABSTRACTS PUBLISHED
1A. <i>Geologic Maps</i>	326
1B. <i>Areal and Regional Geology</i>	224
2. <i>Geomorphology</i>	151
3. <i>Structural Geology</i>	87
4. <i>Stratigraphy and Historical Geology</i>	228
5. <i>Paleontology</i>	263
6. <i>Geophysics</i>	327
7. <i>Geochemistry</i>	226
8. <i>Mineralogy and Crystallography</i>	198
9. <i>Igneous and Metamorphic Petrology</i>	71
10. <i>Sedimentary Petrology</i>	138
11. <i>Geohydrology</i>	132
12. <i>Mineral Deposits</i>	300
13. <i>Fuels</i>	319
14. <i>Engineering Geology</i>	57
15. <i>Miscellaneous</i>	155
TOTAL	3202

Of these abstracts about 61 per cent were submitted voluntarily by journals, state and federal geological surveys in the United States and Canada. These are author abstracts or staff abstracts of the originating agency. Another 16 per cent were abstracts of guidebooks, books, special publications, and isolated geoscience papers in various journals, prepared in response to specific request. The AGI staff prepared 14 per cent of the abstracts. The remaining 9 per cent of the abstracts came from miscellaneous sources.

As the journal developed and became better known, numerous arrangements have been made with individuals in the profession who have volunteered to abstract various journals publishing some geoscience articles. The Engineering Geology Division of the Geological Society of America under the direction of Edwin B. Eckel agreed to undertake to collect and prepare abstracts of engineering geology literature appearing in widely scattered sources. Volunteer abstracters are invited to contact Martin Russell, Manager of Publications, American Geological Institute, 2101 Constitution Avenue, N. W., Washington 25, D. C.



AAPG-SEPM Field Trips Visit Classic Areas

The four field trips to precede this year's annual meetings of the AAPG-SEPM are receiving unprecedented response, according to Harry S. Ladd, General Chairman of the meetings. Although some of the earliest geological work in the United States was done in the areas that these trips cover, it is apparent from this interest, that continued work has sustained geologists' curiosity, with commercial possibilities not yet exhausted.

The trips are intended primarily for members of the AAPG-SEPM but non-member geologists and advanced graduate students will be accepted as participants if space permits. Application with a check made to AAPG-SEPM 1960 Meeting should be sent to ROBERT B. NEUMAN, *Field Trip Chairman, Rm. 337, U. S. National Museum, Washington, D. C.*

The trips are planned for 2 or 3 days, and each is focused on a special field of geology.

TRIP 1. COASTAL PLAIN FACIES VARIATIONS AND STRATIGRAPHY IN NORTHERN NEW JERSEY will be seen by those participating in trip no. 1, led by James P. Owens and coworkers who are currently engaged in U.S. Geological Survey studies there. The Chalfonte-Haddon Hall hotels will be the base for this trip, from its start the morning of April 23. The fee of \$14.00 pays for bus transportation and lunches for the two days, and for the guidebook prepared especially for this trip.

TRIP 2. THE SOUTH MOUNTAIN ANTI-CLINORIUM FROM THE BLUE RIDGE TO THE VALLEY AND RIDGE IN MARYLAND will be viewed by trip no. 2, led by Professor Ernst Cloos and Thomas B. Murphy. The transition from intensely deformed rocks of the core of this structure to the mild deformation of its flanks will be seen, with special attention paid to small-scale structures. Strong cleavage will be seen to give way to deformed collites, and finally to

broadly fanning cleavage in world-famous exposures at Roundtop, Maryland. Oriskany sandstone and related formations will be seen in the extensive glass sand workings near Berkeley Springs, W. Va. The enthusiastic response of the Field Conference of Pennsylvania Geologists indicated that this trip should be given again for those who could not attend that regional meeting. A fee of \$37.00 covers all expenses from departure at Washington, D. C., April 23 to arrival at Atlantic City, including overnight accommodations at Hagerstown, Maryland.

TRIP 3. CARBONATE ROCKS IN MARYLAND AND PENNSYLVANIA, brings together as leaders six geologists who have worked recently on Ordovician limestone in Maryland and Pennsylvania. Environment indicators will be stressed, with ample time allowed for close inspection of outcrops at each stop. The special object of this trip is to encourage exchange of ideas among carbonate specialists, with the stimulation of good exposures. This three-day trip leaves from Washington April 22, with overnight stops at State College and Harrisburg, Penna. Fee of \$55.00 covers all expenses.

TRIP 4. THE GEOLOGY OF THE SHENANDOAH VALLEY AND ITS BORDERING MOUNTAINS will be reviewed by trip 4, led by Professor Byron N. Cooper and members of the Department of Geology at VPI. No trip could offer a better introduction to Appalachian geology, or a better example of the impact of a wide-awake group of geologists on an area whose geology might be said to have been known for a hundred years. The beauty of late April here adds to the attraction of the trip, which starts at Roanoke, Virginia, April 22, with overnight stops at Roanoke and Harrisonburg, arriving at Atlantic City late April 24. Fee of \$67 includes all expenses, entrance fees to Natural Bridge and Endless Caverns, and a valuable guidebook.

GUIDEBOOKS OF GREAT BRITAIN

Through the efforts of the Geology Club, Kingston Technical College, Surrey, England, Christopher J. Ragg, President, we are able to list below a group of guidebooks available from the GEOLOGICAL ASSOCIATION. Other guidebooks to the geology of Great Britain appeared in Congress Corner, October 1959, Vol. IV, No. 3, p. 28:

Geological Association Guides Prices quoted in U.S. currency with an approximate allowance for postage to the U.S. by surface mail.

No. 1. *Geology of the Area Around Birmingham*, by P. A. Garrett, W. G. Hardie, J. D. Lawson and F. W. Shotton. 50¢.

No. 3. *Geology around the University Towns: the Oxford District*, by W. S. Mc-Kerrow. 40¢.

No. 8. *The Area around Stoke-on-Trent*, by F. W. V. Cope. 40¢.

No. 14. *Geology of some British Coastal Areas: The Southampton District including Barton (Hampshire) and Bracklesham (Sussex) coastal sections*, by Dennis Curry and Dorothy E. Wisden. 35¢.

No. 15. *Geology around the University Towns; the Durham Area*, by K. C. Dunham and W. Hopkins. 40¢.

No. 22. *The Dorset Coast from Poole to the Chesil Beach*, by M. R. House. 50¢.

No. 25. *Geology of some British Coastal Areas: The Isle of Wight. I. The Cretaceous; II. The Tertiary*, by C. W. Wright. 40¢.

No. 26. *The Peak District, Derbyshire*, by F. W. V. Cope. 50¢.

No. 27. *The Geology of some Classic British Areas; Geological Itineraries for South Shropshire*, by W. F. Whittard. 50¢.

No. 28. *The Geology of Snowdonia*, by D. Williams and J. G. Ramsay. 40¢.

No. 29. *Geology of The Weald*, by J. F. Kirkaldy. 40¢.

No. 30. *The London Region*, by W. S. Pitcher, N. B. Peake, J. N. Carrick, J. F. Kirkaldy, S. W. Hester and J. M. Hancock. 55¢.

Among other titles the following are nearing publication:

No. 16. *The Geology around the University Towns: The Cardiff District*, by J. G. C. Anderson. 40¢.



AGI MOVES TO NEW QUARTERS

The American Geological Institute moved in early February to the new building of the American Chemical Society at 1155 Sixteenth Street, N.W., Washington, D. C. The mailing address is still 2101 Constitution Ave., N.W., Washington 25, D. C.

In the new eight-story American Chemical Society building pictured above, AGI occupies approximately one-third of the third floor. In making the move it was possible for the first time in over a year to bring all of AGI's headquarters staff together in one building.

Members of the profession are cordially invited to visit the Institute in its new quarters.

Morrisey New AAPG Advertising Manager

Norman S. Morrisey, Consulting Geologist, was recently appointed to the full-time staff of the American Association of Petroleum Geologists as Advertising Manager of the A.A.P.G. Bulletin.

Mr. Morrisey, formerly a member of the editorial staff of the Oil and Gas Journal has wide acquaintance with the exploration field.

A graduate of geophysics from the Colorado School of Mines, Morrisey received his Master's degree in geological engineering from the University of Tulsa.

No. 18. *Geology around the University Towns: North-East Ireland The Belfast Area*, by J. K. Charlesworth and J. Preston.

Order from *Benham & Company, Ltd.*, Publishers, 12 Culver St., Colchester, England or *The Geology Club, Kingston Technical College, Kingston-upon-Thames, Surrey, England*.

**AAPG-SEPM Meeting focuses
attention on . . .**

OIL AND GAS FRONTIERS IN THE EAST

By

ALBERT I. INGHAM¹

A famous geologist made the following statement 74 years ago, "I take this opportunity to express my opinion in the strongest terms, that the amazing exhibition of oil and gas which has characterized the last twenty years, is nevertheless, not only geologically but historically, a temporary and vanishing phenomenon—one which young men will live to see come to its natural end . . . , and there does not remain upon my mind a shadow of doubt respecting the practical extinction, in the comparatively near future, of that great commerce in oil . . . , I hold the same opinion respecting gas, and for the same reason, with the difference merely that the end will certainly come sooner." (Ashburner, 1886)

The above statement, made in 1886, was spoken by the very able Director of Pennsylvania's Second Geological Survey, J. P. Lesley. One wonders if Lesley was supported, in the statement, by his capable subordinate, John F. Carll, perhaps the world's first real petroleum geologist. We cannot be too critical of the brilliant Lesley, however, since his many achievements far exceed his misjudgment on oil and gas reserves. His work was reviewed in a recent issue of *GeoTimes*. Lesley's statement is interesting, however, since his own State of Pennsylvania, in 1960, still has many oil and gas discovery frontiers to be explored.

It is appropriate that the 1960 national convention of the American Association of Petroleum Geologists is being held in the East, as this part of the country is now witnessing an unprecedented entry of the major oil companies into the Appalachian Basin, birthplace of the oil industry, and a huge province with numerous attractive untested objectives.

Many fine papers on the oil and gas prospects of the area have been written in the past ten to fifteen years. Because of space limitations of this discussion, however, the reader is referred to the accompanying bibliography for details. This paper briefly describes the more important oil and gas objectives of the northeastern United States, particularly the little explored lower Paleozoics. Emphasis is placed on the Appalachian Plateau area, as this province includes in one place or another, most of the Paleozoic section. The Plateau province is currently the focus of major oil and gas exploration interest,

the area is huge, and there are numerous horizontal and vertical frontiers—that is lateral extensions of proved production and depth probing of the older sediments—still to be explored. The Plateau discussed extends east from the Cincinnati arch to the Appalachian structural front, and from the State of New York to eastern Kentucky. Brief comments are also made on the Ridge and Valley and Atlantic Coastal Plain provinces.

APPALACHIAN PLATEAU

Cambro-Ordovician—The sediments of the Cambro-Ordovician comprise the great vertical oil and gas frontier of the Plateau. Although these strata have furnished some production for years in a few areas of the Plateau, such as western New York and central and eastern Kentucky, the systems are undrilled over tens of thousands of square miles. The sediments comprise a clastic-carbonate sequence possessing the geologic factors indicative of a petroleum province—source and reservoir beds, with structure, large and small, major and mi-

¹Chief Geologist, The Peoples Natural Gas Company, Pittsburgh, Pennsylvania.

nor unconformities, permeability wedges, wedge outs, and abundant evidence of oil and gas. Except for localized fringe developments, few wells have drilled into the Cambro-Ordovician in vast areas of the Plateau. The majority of these tests, however, have had gas and/or oil shows in some parts of the sequence.

The stratigraphy of the Cambro-Ordovician is fairly well known in the Ridge and Valley outcrop areas east of the Plateau, although even here many areas have never been studied in detail. The character of the subsurface extension of the Cambro-Ordovician under the Plateau must be deciphered by interpolation between the eastern outcrop section and the few wells which have drilled some or all of the sections in the west-central or western part of the area.

Beginning with the older Paleozoics, the sections of greatest interest are the widespread Upper Cambrian dolomites, and sandstones. Production has been obtained from the Knox dolomite (Cambro-Ordovician) and "St. Peter" of eastern and central Kentucky, a thick carbonate section with scattered sandstones. The Knox, however, has been poorly tested horizontally and vertically. Minor oil and gas production has been found in the upper Cambrian in central Ohio (Appal. Basin Ordov. Sympos., 1948, Fettke, p. 1491). Gas, oil, and water shows are not uncommon in the few wells which have drilled into the Gatesburg, Potsdam, and other sandstones and dolomites of the Upper Cambrian section.

In addition to the possibility of gas and oil accumulation being found in the Cambrian on local structures, the progressive thinning and/or westward disappearance of approximately 5000 feet of section offers the possibility of stratigraphic traps just up dip from the central part, and in the western part of the Plateau. The top of the Cambrian will be deep—in excess of 15,000 feet in the eastern Plateau area—but rather rapid basinward dip soon brings the upper part of the system to easily drilled depths in the western area.

Except for the western and northern border of the Plateau, the Ordovician section, like the Cambrian, is practically unexplored. Trenton gas production has been found in western New York, and small quantities of oil have been discovered in the Rose Hill area of southwestern Virginia in the Ridge and Valley province. The Knox production, partly of Ordovician age, has been referred to above.

Between these producing areas are immense stretches of the northern and cen-



Spring at Winterthur will be one of the treats in store for the ladies attending the AAPG-SEPM meeting in Atlantic City, April 25-28. Pictured above is Winterthur, near Wilmington, Delaware, which was the former residence of Henry Francis duPont. Winterthur, surrounded by beautiful gardens which will be a riot of color by late April, was made by Mr. duPont into a museum of furnishings and decorative arts of Early America—1640-1840. The ladies in addition to the Winterthur trip will visit historic Philadelphia and will enjoy various social functions at Atlantic City including a sherry party and fashion show.

tral Plateau where the Ordovician has never been tested. Perhaps the most attractive target for exploration in the system is the Lower Ordovician Beekmantown, a predominantly dolomite section lying below a major unconformity at the base of the Middle Ordovician. The unconformity may be important in the localization of oil and gas where it overlaps the truncated early Ordovician and Cambrian. Oil and gas shows are frequently found just below this unconformity.

The Middle Ordovician Black River-Trenton should be considered a target particularly in the eastern Plateau where deformation may be extensive enough to create fracture porosity and permeability. Areas of dolomitization also offer chances for accumulation although much more subsurface data is necessary as a guide to exploration for such zones.

The Oswego-Bald Eagle sandstones of the upper Ordovician, which grade westward into silts and shales, offer stratigraphic trap possibilities in western New York, western Pennsylvania, Maryland, and West Virginia.

As to the structural details of the Cambro-Ordovician of the Plateau, little is known although it appears likely that these lower Paleozoics have a west to east structural gradient from the uncomplicated attitude of the western Plateau, increasing to strong folds in the eastern Plateau, and on to the very complex folded and faulted Ridge and Valley province. This is similar to the younger Paleozoics except it is not

necessarily true that the Cambro-Ordovician and perhaps the Silurian, in the Plateau subsurface, is as structurally complex as the overlying Lower and Middle Devonian. In fact, there is some evidence that the very complex structure of these Devonian strata, as revealed by numerous wells in parts of western Pennsylvania and adjacent areas, is underlain by a much simpler Silurian and Cambro-Ordovician structure. This structural difference has been discussed by Woodward (1959), and it is also suggested by unpublished scattered seismograph data. The relationship, if true, is of more than academic interest to the oil and gas explorationist, not only from the geologic standpoint, but from the economic as well.

Summing up the Cambro-Ordovician possibilities of the Plateau, the oil and gas potential appears most attractive. In some areas, the drilling depths required to test the entire section, perhaps 20,000 feet or greater to the basement in the eastern Plateau, will be a temporary hindrance to exploration, but easily attained depths through the complete section will be found in the western areas. Rapid advances in drilling technique, such as turbodrill or turbo-percussion drilling, may soon sharply decrease drilling costs to the deep objectives in any part of the province.

Silurian. The basal Silurian Medina-Clinton sandstones have produced large quantities of gas in eastern Ohio and western New York for many years. These beds have also produced minor amounts of gas in several small areas in Pennsylvania and West Virginia. Currently, a drilling boom is underway in eastern Ohio as productive extensions to old producing areas are being opened up with the assistance of the remarkable hydraulic fracture technique. Offshore, one need only look at a regional Medina-Clinton production map of the Ohio-New York-Ontario area to realize the possibilities of Lake Erie from these beds.

In the Middle Silurian section, the "Corniferous"—Lockport and "Big Six"—Keeler of eastern Kentucky have been important producers of oil with some gas. The Lockport also produces gas in several small areas in eastern Ohio, northwestern Pennsylvania, southwestern New York, and the Salina—Guelph is an important producer of gas in southwestern Ontario.

To the east and south of the above described Lower and Middle Silurian producing areas, the Silurian section is practically unexplored over huge areas of the Plateau. Ranging from depths of 11,000 to 12,000 feet in the eastern area, the

strata can easily be reached at half these depths to the west. The lower Silurian is a vertical frontier within 3000 feet, or less, of the relatively well explored Lower Devonian.

Devonian. An exploratory campaign of the Lower Devonian Oriskany sand, commenced in 1930, is still being actively pursued after 30 years in Pennsylvania, West Virginia, New York, Ohio, and Maryland. Many Oriskany gas fields have been found, and the immediately overlying Onondaga—Huntersville chert is also often productive. Even though this Lower Devonian exploration has been vigorously pursued during most of the three decades, numerous Lower Devonian prospects still remain to be drilled.

Middle Devonian shales have produced for years in eastern Kentucky and adjacent West Virginia, and a part of the "Corniferous" limestone production of Kentucky is derived from the Devonian. Dark shales of Hamilton-Marcellus age, of widespread occurrence in the Plateau, have occasionally had gas "blowouts" of short duration. One wonders if there might be abundant supplies of gas in these shales, gas which someday will be produced with the aid of new methods of production stimulation.

The Upper Devonian of the Plateau contains the numerous sands which have produced oil and gas since Colonel Drake drilled his famous well in 1859. Although heavily drilled in many areas, these strata are far from being exhausted. Exploration of the Upper Devonian was revitalized in the early 1950's with the advent of the hydraulic fracture method. Many hundreds of old producers are being fractured and numerous undrilled areas containing relatively "tight" Upper Devonian sands, too impermeable to produce naturally, are now being brought into production in a new well program.

Mississippian-Pennsylvanian. These strata, like the Upper Devonian, have been productive in wide areas of the Plateau. Yet some excellent new gas production from the Greenbrier—"Big Lime" of West Virginia and Kentucky is still being found, and the Berea sand of Ohio is undergoing active exploration with good results. Frontiers still exist in these late Paleozoics in considerable parts of the province.

RIDGE AND VALLEY PROVINCE

This province, lying immediately east of the Appalachian Plateau, is bounded on the west by the Appalachian structural front, and on the east by the Blue

(Continued on page 33)

GEOL OGY

In the Public Eye

by
Robert L. Bates

Department of Geology, Ohio State University
Columbus Ohio

Once, at another time and in a far-off place, a group of scientists were sitting around trying to figure a way of spending some of their government's money. (The National Utopian Trust, or NUT, had just been allocated 47 billion drachmas and was looking for worthy projects.) The old idea of building a bridge across the country's longest river-lengthways—was reluctantly discarded, as not advancing scientific frontiers. Finally, some one set down his coffee cup and asked, "Why not dig a coast-to-coast trench, to bedrock?"

The more this was considered, the better it seemed. It had never been done. It would entail a lot of work by many people over a long period. It would advance a great many scientific frontiers (the exact nature of which would require study, of course). Publicitywise it was a natural. And best of all, it would cost money. Man, would it cost money!

The Committee on the Scientific Trench (COST) was organized forthwith. A preliminary study group found geological, biological, pedological, seismological, biogeochemical, and geophysical reasons for the project. Another group took up the problem of ways and means, and gratefully accepted an offer by the Super Scooper Corp. to develop the necessary new trenching machinery. Still other scientists were busy determining the line along which the trench was to be laid out. This was made difficult because the Defense Department, for classified reasons, insisted that the trench be 40 feet wide.

Needless to say, geologists were engaged in many of these activities, and a number of eminent members of the profession found reasons to join the team. The total staff quickly grew to 394 people. The project was estimated to take 17 years and cost 17 billion drachmas. Support was guaranteed by NUT. A little publicity shortly made the whole world COST-conscious, and the project was universally acclaimed for its great scientific value.

Moral: *A project with infinite sums of money may be weird but it isn't funny.*



Dr. T. J. van Andel, marine geologist from the Netherlands is participating in the AGI Visiting International Scientist Program sponsored by the American Geological Institute with the aid of a grant from the National Science Foundation (GeoTimes, Jan.-Feb., 1960, p. 18-19). Dr. van Andel, who received his doctorate at the University of Groningen where he studied under Professor Philip H. Kuenen, is currently engaged in research work at Scripps Institution of Oceanography. He will be visiting four universities during the coming months. Dr. van Andel was a participant in the AAPG Distinguished Lecture Tour in 1957.

Professor L. U. de Sitter who was to have come to the United States as one of the AGI Visiting International Scientists has recently undergone a serious operation and will not be able to make the trip as planned. Professor Paul K. Ramdohr and Dr. Stevenson Buchan, other participants are already in this country and Professor Augustin Lombard is expected in mid-March.

PANEL ON INFRARED AND RADAR PHOTO INTERPRETATION

The Annual Meeting of the American Congress of Surveying and Mapping—American Society of Photogrammetry which will be held at the Shoreham Hotel, Washington, D. C., March 20-26, will feature on March 24 a **PANEL ON INFRARED AND RADAR PHOTO INTERPRETATION**. This symposium will be of interest to photogeologists and geologists working in the field of "planetology."

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AIME	73	27	77	23	76	24
NAGT	90	10	96	4	96	4
GS	61	39	83	17	83	17
GSA	87	13	85	15	85	15
MSA	74	26	82	18	81	19
PS	69	31	97	3	95	5
SSA	45	55	71	29	68	32
SECG	55	45	78	22	77	23
SEPM	77	23	87	13	87	13
SEGP	42	58	68	32	61	39
SVP	75	25	97	3	91	9
ALL SOCIETIES	69	31	75	25	72	28

SEVENTY-TWO PERCENT OF THE PROFESSION FAVORS A FORM OF INDIVIDUAL SUPPORT FOR THE AMERICAN GEOLOGICAL INSTITUTE as determined by the recent AGI Opinion Survey which was directed to twenty-five percent of the entire profession.

In December, a group of geologists-geophysicists with a strong interest in the future of the American Geological Institute recognized the need for a "grass roots" sampling of opinion with regard to the financing of the AGI. This group agreed to underwrite a survey of a representative cross section of the profession to determine whether individuals would assume a specific obligation for a share in the annual support of the Institute.

A single sheet describing the AGI problem and a return postal card were sent to 5800 (25%) of the nearly 24,000 members of AGI Member Societies in the United States who are currently receiving *GeoTimes*. The selection was made by taking every fourth drawer in the addressograph file which is organized geographically, so the selection afforded excellent geographic coverage, but made no distinction whatsoever concerning the recipients' society affiliation.

Forty-five percent (45%) of the recipients responded to the "yes" or "no" vote question as to whether they would be willing to assume a specific obligation to support the Institute.

The returns were sent to the Illinois Geological Survey and tabulated by them. They are summarized by percentages in the accompanying table.

Seventy-two percent (72%) of all respondents favored a specific financial obligation of individuals on behalf of AGI. Those holding membership in only one AGI Member Society are less responsive to this idea than those holding multiple memberships. Members of those societies with a substantial part of their membership involved in applied geology (economic geology of petroleum and minerals—including exploration geophysics) were less sympathetic to support of AGI, but even here the majority favored the specific individual obligation.

Statisticians indicate that the twenty-five percent sampling of a group of this magnitude is more than adequate and that a forty-five percent return in the pre-Christmas rush was very good. It appears therefore that the majority of the profession has time to recognize the need for AGI and

MANPOWER in a column -



By HOWARD A. MEYERHOFF
Scientific Manpower Commission

1507 M Street, N.W., Washington 5, D.C.

The engineering profession is in trouble.

In September 1958, freshman enrollments dropped 11 percent. The September 1959 count shows they are down another 3.5 percent.

In the earth science fields, the reaction to economic factors is understandable. Even so, it was more violent than the situation warranted. Last June, 239 bachelors degrees were awarded in mining engineering. In September, however, only 212 freshmen enrolled in this field. Figure in the usual mortality, and the profession will have a lower addition to its ranks in 1963 than it has had since the turn of the century.

Petroleum engineering fared no better. The class of '63 contains 510 freshmen. The class of '59 had 731 graduates.

In metallurgy, 588 freshmen entered in September to replace 724 graduates. Presumably, extractive metallurgy suffered the heaviest loss.

For those who wish to read—and weep—complete figures follow:

	1957	1958	1959
	B.S. Fresh	B.S. Fresh	B.S. Fresh
Ceramic Eng.	128	218	169
Metallurgical Eng.	557	653	670
Geophysical Eng.	33	64	27
Geological Eng.	227	386	225
Mining Eng.	231	368	240
Petroleum Eng.	650	1,224	687
Totals	1,826	2,913	2,008
	1,916	2,150	1,726

A drop of 41 percent in two years would be catastrophic in any other field. Will it be in ours?

It reflects the low value the American public and public officials place on the mineral raw materials base on which the American economy was built. It is a sad commentary on professional public relations and an eloquent tribute to professional inaction.

Once upon a time a committee was appointed to do something. It hasn't been heard from since.

is willing to pay a specific share of its cost of operations. The AGI Reorganization Committee with this survey as background is moving toward specific proposals for a stronger Institute with a predictable basic income.

A reminder that... AGI needs your help

in 1960

1960 BUDGET

AGI

GENERAL OPERATIONS!



*Special project funds derived primarily from grants received for education programs, translations, abstracts and the National Register are not included. These funds are ear-marked and cannot be applied to general operations and GeoTimes.

How YOU can HELP

- \$10 Contributed will enroll you in the Committee of 1000 for AGI-1960
- \$2 Contributed will carry your share of GeoTimes

Use the envelope
from the center of the
January-February GeoTimes



LAFAYETTE GEOLOGICAL SOCIETY SPONSORS SCIENCE TEACHER TRAINING PROGRAM

Robert Copeland, left, A. A. P. G. Public Information Committee member, presenting a set of 100 rock, mineral and fossil specimens to Mr. Sidney LeBlanc, Principal of the Duson Elementary School, for class room instruction. Right is Tom Eby, publicity director of the Lafayette Geological Society. Collections were distributed to six schools as attendance awards for lecture series.

The Lafayette Geological Society, in cooperation with the Public Information Committee of the American Association of Petroleum Geologists, sponsored a lecture series and field trip for the science teachers of the Lafayette Parish School System. This series had the endorsement of the School Board and the principals who are responsible for the education of over 20,000 high school and elementary school students in the Parish.

Lafayette is the site of Southwestern Louisiana Institute, whose permission to use their facilities was graciously given. Dr. John C. McCampbell, head of the Department of Geology, arranged not only class room and laboratory space but enlisted four members of his staff to serve as lecturers. Five members of the petroleum industry took time out to prepare and deliver lectures.

Lectures were held in the Engineering and Geology Building at Southwestern on Thursday evenings from 7:00 to 9:00 p.m. An average of twenty teachers attended each lecture. Separating the first four lectures from the second four, the teachers were taken on a field trip. Myles Salt Company furnished a guide who conducted the group through the Weeks Island Salt Mine where actual mining operations were in progress and on through the complete process from the original blasting to the finished package ready for sale.

Dr. McCampbell began the lectures with discussion of the nature of the earth and its setting in the Universe. Professors William R. Paine and Billy Jobe presented two sessions on rocks and minerals and their origins. Professor Walter P. Kessinger, Jr., gave the group a talk on forces acting on the earth, erosion, transportation, sedimentation and land forms. Dr. James F. L. Connell presented two sessions on the origin of the earth, measurement of geologic time and the introduction to paleontology. All of the rock and mineral collections, museum exhibits, models and

other material used during normal college class room studies were made available by the Department of Geology.

Structural geology, both surface and subsurface was under the able teachings of Dr. W. E. Wallace, Division Geologist of Forest Oil Company. Geophysical theory and methods together with the actual examination of the seismograph, magnetometer, gravity meter, and torsion balance, all of which are in working condition at Southwestern, were presented by R. Ned Pratt, Sun Oil Company, and John W. Bell, Jr., of Texas Pacific Coal and Oil Company.

The final lecture entitled Petroleum—its origin, accumulation and production was presented by Fred W. Bates, consulting geologist, senior partner Fred W. Bates and Associates, and James W. Sheller, Vice-President of State Exploration Company.

As an award for attending the lecture series, the Lafayette Geological Society provided funds for the purchase of a complete elementary mineral and rock collection plus 25 fossils for each of the schools for their use in class room studies.

The lecture series was organized and arrangements and schedules worked out by Robert R. Copeland, consulting geologist acting on behalf of the Lafayette Geological Society as part of the functions of the Public Information Committee of the American Association of Petroleum Geologists. It is hoped that this series will become an annual program. Certainly earth science offers a sufficient number of topics to build many different non-overlapping lecture sets and the final beneficiaries are our own children.

COMMITTEE OF 1000 reaches 200

The Committee of 1000 for AGI-1960 is composed of persons who support the work of the American Geological Institute and GeoTimes with a contribution of \$10 or more. Standards of performance expected of the AGI by the profession outstrip considerably the funds made available by the profession through the voluntary contributions of the Member Societies. For this reason contributions of individuals are vital to AGI and its program, which incidentally returns to the profession nearly \$10 for each \$1 invested by the profession. It is hoped you will add your name to this list, or at least make a small contribution to AGI and GeoTimes (*use envelope in Jan.-Feb. GeoTimes*).

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Ratios of

Students

to

Faculty

**Data shows ratios
of students to faculty
in U.S. and Canadian
departments of the
geological sciences**

AREA & TYPE OF INSTITUTION	TOTAL NUMBER SCHOOLS	TOTAL NUMBER FACULTY	TOTAL NUMBER STUDENTS	TOTAL NO. STUDENTS PER FACULTY MEMBER
NEW ENGLAND Public	5	22	124	5.6
Private	18	94	477	5.1
MID-ATLANTIC Public	8	56	380	6.7
Private	26	121	738	6.1
SOUTH ATLANTIC Public	11	60	441	7.4
Private	7	26	136	5.2
EAST NO. CENTRAL Public	17	156	1239	7.9
Private	25	71	382	5.4
EAST SO. CENTRAL Public	6	39	349	8.9
Private	5	10	76	7.6
WEST NO. CENTRAL Public	14	102	1040	10.2
Private	9	34	194	5.7
WEST SO. CENTRAL Public	18	141	1734	12.3
Private	11	46	466	10.1
MOUNTAIN Public	16	126	1259	10.0
Private	3	15	124	8.3
PACIFIC Public	15	120	832	6.9
Private	9	54	407	7.5
ALL AREAS	223	1293	10398	8.0

Table 1. Ratio junior, senior and graduate student majors to faculty in departments of geoscience in institutions of the United States grouped geographically and separated into those receiving public and private support.

LEVEL OF DEGREE GRANTED	NUMBER SCHOOLS	NUMBER FACULTY	NUMBER STUDENTS	TOTAL NUMBER STUDENTS PER FACULTY MEMBER
Ph.D.	8	63	616	9.8
Master's	5	26	134	5.2
Bachelor's	5	16	73	4.6
All Levels	18	105	823	7.8

Table 2. Ratio of junior, senior and graduate student majors to faculty in departments of geosciences in the colleges and universities of Canada.

¹ Compiled by Mrs. Bonnie C. Henderson Supervisor, Earth Sciences Register Project.

² "Survey of Geology-Geophysics Students in the Colleges and Universities of the United States and Canada in 1958-59 With Information on Available Scholarships, Fellowships, Assistantships, Etc." AGI Report 12, 1959 Edition, \$0.50.

³ "Directory of Geoscience Departments in the Colleges and Universities of the United States and Canada" AGI Report 11, 1960 Edition, \$2.00.

⁴ Reproduced from figure 2, page 13, *GeoTimes* Vol. IV, No. 4, Nov.-Dec., 1959.

As an outgrowth of the data assembled in the preparation of recent AGI reports, the Institute has compiled data on the ratio of students to faculty in the 223 colleges and universities in the United States and 18 in Canada offering at least a major in the geosciences. These data were derived from the 1959 survey of geology-geophysics students, AGI Report 12, 1959 Edition,² and the new Directory of Geoscience Departments, AGI Report 11, 1960 Edition.³

Figure 1 shows the percentage distribution of geoscientists in the United States by region of employment.⁴ This figure is important because it affords a standard of comparison between the distribution of employed professional geoscientists and the schools engaged in training professional geoscientists.

Table 1 shows pertinent data on the distribution of departments of the geosciences in public and private institutions in the various geographic areas delineated in Figure 1 with related information on the total number of faculty, students (3rd year undergraduates through Ph.D.) and the ratio of students to faculty members. Table 2 presents a similar summary of data from 18 Canadian colleges and universities.

Figures 2, 3, 4 are maps showing the ratio of students to faculty members by geographic area, with a grouping of the schools according to the highest degree offered by the departments of geosciences. All of the Ph.D.-granting departments are grouped in Figure 2. The departments offering training only through the Master's degree are grouped in Figure 3. Departments offering undergraduate degrees only are grouped in Figure 4.



Figure 1. Percentage distribution of geoscientists by region of employment based on 1956-58 data from the National Register.



Figure 2. Average number of students majoring in geosciences, from junior years through doctor's level, per faculty member in departments offering Ph.D. degrees grouped by geographic areas.



Figure 3. Average number of students majoring in geosciences, from junior year through master's level, per faculty member in departments offering master's degrees grouped by geographic areas.



Figure 4. Average number of junior and senior students majoring in geosciences per faculty member in departments offering only undergraduate degrees grouped by geographic areas.

Many additional and equally interesting observations can be made relating to student-faculty ratios by comparison of data appearing in AGI Reports 11 (1960) and 12 (1959). The data in these two reports do not give any indication to the total number of students enrolled—major and non-major—in all geoscience courses taught by these departments. Obviously some departments direct considerable staff effort into the teaching of courses for non-majors. On the other hand some larger departments substantially augment their teaching staff through the use of guest lecturers and graduate assistants.

No attempt is made to analyze the data presented in these tables and figures. Each reader is free to draw his own conclusions. It is believed, however, that these data will afford some interesting ideas and comparisons which will have a beneficial effect on geoscience education.

Texas Forms NAGT Section

A Texas Section of the National Association of Geology Teachers was organized at a recent meeting held in conjunction with the Texas Academy of Science sessions in Austin, Texas. Officers elected are: *President*, Horace R. Blank, Texas A. & M. College; *Vice-President*, William H. Matthews III, Lamar State College of Technology; *Secretary-Treasurer*, Robert E. Boyer, University of Texas; *Editor*, James W. Dixon, Baylor University; *National Committee Representative*, William R. Muehlberger, University of Texas. The organization of this new section has been received with enthusiasm and is viewed as a great step forward in Texas geology. All Texas geology teachers are invited to join the new section by writing the secretary.

Plan Permanent International Cooperation in Geophysics

Plans for permanent international cooperation in geophysics and related sciences have been formulated by a new international committee, according to a report prepared by Dr. Hugh Odishaw, Executive Director of the U. S. National Committee for the IGY and Director of World Data Center A, National Academy of Sciences. According to this report, appearing in the December *Transactions of the American Geophysical Union*, scientists of the United States and other nations have already outlined critical activities for the next few years.

The new Committee, established by the International Council of Scientific Unions late in 1959, succeeds the international IGY committee and proposes in large measure to pursue the IGY pattern of world cooperation. It is called the International Geophysics Committee—abbreviated CIG, after the initials of its French name, "Comité International de Géophysique."

The basic objectives of the Committee are twofold. The Committee assumes the functions of the international IGY committee for completion of IGY and IGC-59 data interchange and publication of IGY and IGC-59 results. CIG also has a continuing mandate to develop and coordinate international plans for cooperation in geophysics on a permanent basis.

Looking to the future, CIG has called for a continuation of the IGY pattern of world cooperation in geophysical research during 1960 and 1961. In this connection, the CIG recommended that the three World Data Centers set up as an integral part of IGY and IGC-59 be permanent depositories for geophysical data although the needs for data interchange and the exact nature and form of such data are to be reviewed periodically. The uninterrupted operation of these Centers (located in the U.S., the U.S.S.R., and in Western Europe, Australia and Japan) ensures the continuation of a proven method of data interchange.

The proposed effort for 1960 and 1961 calls for international cooperation in the normal geophysical programs of the nations of the world. Emphasis is placed on the interchange of national program plans and of results of geophysical studies that are parts of the regular and continuing efforts throughout the world. The unusual

growth of geophysics during the last five years, stimulated by the IGY, means that activities in these fields will equal or even surpass those of the IGY period. The fields of study will include the earth sciences (seismology and gravity determinations), the heat and water regimen (meteorology, glaciology and oceanography), and the upper atmosphere (aurora and airglow, cosmic rays, geomagnetism, ionospheric physics, and solar activity).

Special major efforts, in addition to the regular activities in geophysics, will be considered by the CIG as the needs of science develop. In this area, the first action of CIG was its endorsement of the conduct of a World Magnetic Survey, to be made during a quiet part of the eleven-year sun spot cycle—the mid-1960's. The last survey was made in the 1920's. Secular changes in the magnetic field, new tools and methods, and recent interests (especially those of space science) call for this survey.

In pursuit of its responsibilities for completion of the IGY and IGC-59 programs, CIG is pressing ahead with publication of the IGY Annals which will include processed data and summary reports of IGY and IGC results, and is urging the 66 national IGY committees to complete IGY-IGC data interchange. Moreover, the two-year period, January 1, 1960, to December 31, 1961, has been formally characterized by CIG as the "IGY-IGC analysis and theoretical research period" in an attempt to encourage and intensify the work of interpretation of the unprecedented amount of data collected since July 1, 1957.

Membership of CIG is as follows:

Bureau members: President, V. V. Belousov (USSR); three Vice Presidents, Edward Appleton (UK), John R. Winckler (USA), and M. Minnaert (Netherlands); Secretary, G. Laclavere (France).

Other members: *Meteorology*, J. van Miegham (Belgium); *Nuclear Radiation*, B. Bolin (Sweden); *Aeronomy*, M. Nicolle (Belgium); *Geomagnetism*, V. Laursen (Denmark); *Aurora and Airglow*, C. T. Elvey (USA); *Solar Activity*, M. A. Ellison (Ireland); *Ionosphere*, W. J. G. Beynon (UK); *Cosmic Rays*, S. N. Vernov (USSR); *Oceanography*, V. G. Kort (USSR); *Glaciology*, G. de Q. Robin (Australia); *Seismology*, F. Press (USA); and *Paleogeophysics*, T. Nagata (Japan). In accordance with the CIG charter, representatives of World Data Centers A and B, Hugh Odishaw (USA) and P. K. Evseev (USSR), became members upon designation by their academies.

Data Pertaining to Important Non-Silicate Minerals

Prepared by Y. William Isachsen

GLOSSARY OF GEOLOGY AND RELATED SCIENCES, J. V. Howell, Coordinating Editor, 325 pages, 1957, \$6.00.

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Data Sheet 17

Data Sheet 17, *Data Pertaining to Important Non-Silicate Minerals* has been prepared for the AGI Data Sheet Committee by Dr. Y. William Isachsen of the New York State Museum.

A number of interesting data sheets are in various stages of planning under the direction of the Data Sheet Committee. Members of the Committee are as follows:

VOL. IV, No. 6

ABBREVIATIONS: S&H, crystal system or division and maximum hardness; Cleavage: 010, 110, etc.; Color: bl, blk, br, grn, gy, or, pink, purp, r. w. y; Lustre: ad, met, submet, res, vit; Misc: agg, aggregates; alk, alkaline; c, colorless; cap, capillary; cl, cleavage; conch, conchoidal fracture; deliq, deliquescent; eff, dark; eff, effervescent; fl, fluoresces; fla, flame test; fus, fusibility; h, hardness; lt, light; mag, magnetic; prtg, parting; rad, radioactive; sg, specific gravity; stl, steel; streak; tab, tabular; tarn, tarnish; transp, transparent; wk, weak; (ly), xls, crystals.

Mineral	Composition	S&H	S.G.	Distinguishing Features
NATIVE ELEMENTS				
Gold	Au	I 3	19.3	met,y, malleable, ag
Silver	Ag	I 3	10.5	Ag-w,malleable, sg
Copper	Cu	I 3	8.95	met,r,malleable, sg
Platinum	Pt	I 4½	19.	stl,gy,sg
Sulfur	S	2½	2.07	y,met,sh,ill,fl
Diamond	C	I 10	3.53	blk,sh,ill,fl
Graphite	C	H 2	2.23	blk to gy,gresy
SULFIDES				
Argentite	Ag ₂ S	I 2½	7.4	scitile,met,dk gy, sg
Chalcocite	Cu ₂ S	0 3	5.8	scitile,Pb-gy
Bornite	Cu ₅ FeS ₄	I 3	5.08	met,br,brownish,blk tarn
Galena	PbS	I 2½	7.56	100,Pb-gy,sg,h
Sphalerite	ZnS	I 3	4.1	met,br,sh,fl
Chalcopyrite	CuFeS ₂	T 4	4.3	brass,y,h
Stannite	Cu ₂ Fe ₅ S ₈	T 4	4.5	stl-gy to Fe-hik,fus 1½
Greennockite	CdS	H 3½	4.9	y,vit
Pyrhardtite	Fe ₂ S	H 4	4.65	coarse, massive, mag
Nickeliferous	NiAs	H 2½	2.9	Co,sh,fl
Millerite	NiS	R 3½	5.5	pale brass y, cap xls
Pentlandite	(Fe,Ni)S ₂	I 4	5.0	bronze,ill,prtg,non-mag
Covellite	CuS	H 2	4.76	indigo-bl,sh,fr
Cinnabar	HgS	R 2½	8.09	r,y,scarlet, strk,10½
Red Lead	Pb ₃ O ₂	M 2	9.09	met,sh,fl
Orpiment	As ₂ S ₃	M 2	3.49	y,red,10½,h
Stibnite	Sb ₂ S ₃	O 2	4.62	Pb-gy,bladed,0.010,fus 1
Bismuthinite	Bi ₂ S ₃	O 2	6.78	Pb-gy,bl,fus 1
Pyrite	FeS ₂	I 3	5.02	pale brass y
Cubanite	Co ₃ S ₂	I 5½	4.1	Ad,sh,fl
Marcassite	Fe ₂ S ₃	O 6½	4.89	dark y, "cockscomb" xls
Arsenopyrite	FeAsS	M 6	6.22	Ag-w,c, smaltite
Molybdenite	MoS ₂	H 1½	4.73	Pb-gy,bl,tone,0001
Calaverite	As ₂ S ₃	M 3	9.44	brass y to Ag-w,sg
Sylvanite	(Ag,Al)Te ₂	M 2	1.16	Ag-w,sg,0.010,fus 1
Smallite	(Co,Ni)As ₂	I 6	6.9	arsenopyrite,Co test
SULFOALS				
Polybasite	(Ag,Cu) ₂ Sn ₃ S ₁₁	M 3	6.2	short "hex" prisms, stl-gy to blk
Pyrrhotite	Fe _{1.5} Sn ₃ S ₁₁	R 2½	5.85	deep r,ad,10½
Proutite	Ag ₂ Sn ₃ S ₁₁	R 2½	5.57	ruby,r,ad,10½
Tetrahedrite	(Cu,Fe) ₂ Sn ₃ S ₁₁	I 3	5.1	tetrahedrons,gy to blk
Tennantite	(Cu,Fe) ₂ Sn ₃ S ₁₁	O 4½	4.95	terephedrons,gy blk to blk
Enargite	Cu ₃ S ₂	O 3	4.50	blk to Fe-hik,sh
Bournonite	Pb ₂ Sn ₃ S ₁₁	O 3	5.86	stl-gy to blk,xls
Jamesonite	Pb ₂ FeSn ₃ S ₁₁	M 2½	5.63	gy blk, acicular to fibrous
SIMPLE OXIDES				
Cuprite	Cu ₂ O	I 4	6.14	r,ad,xls
Zincite	ZnO	H 4	5.68	deep r to or y
Cornwallite	Fe ₂ O ₃	R 9	4.1	h-ag,prtg,0.001 and 10½
Hematite	Fe ₂ O ₃	R 9	5.26	met,sh,blk
Uelite	Fe ₂ O ₃	R 6	4.76	Fe-hik,sh,blk to r
Rutile	TiO ₂	T 6½	4.25	ad,r to r br to blk
Pyrope	MnO ₂	T 6½	5.08	blk,blk,sh
Cassiterite	SnO ₂	T 6½	6.25	ad,br to blk,sh,blk
Anatase	TiO ₂	T 6	3.90	ad,br to blk,sh,blk,0.01,011
Brookite	TiO ₂	O 6	4.20	met,ad,br to Fe-hik
Uraninite	UO ₂	I 6	10.63	blk,submet to dull, sg, rad

REFERENCES: Dana's System of Mineralogy, 7th Edition, Palache, Berman and Frondel, John Wiley and Sons, Inc.; U. S. G. S. Bulletin 1009-B.

Richard M. Foose, Chairman

John E. Allen

William Beatty

Chester Longwell

Vincent McKelvey

George Thompson

Ian Campbell

Ideas for data sheets should be directed to Dr. Richard M. Foose, Chairman, Earth Science Division, Stanford Research Institute, Menlo Park, California.

Mineral	Composition	S.H.	S.G.	Distinguishing Features
HYDROXIDES AND OXIDES CONTAINING HYDROXOL				
Brucite	Mg(OH) ₂	H 2½	2.40	0001, pearly, w.gr.y, lt.grn
Enstatite	Mg ₂ SiO ₅	O	3.1	010, in bauxite
Gibbsite	Al(OH) ₃	3½	2.42	001, pearly, in bauxite
Palomelane	BaMnMnO ₄ (OH) ₄	O 6	4.72	blk, submet, strk br blk
MULTIPLE OXIDES				
Diaspore	Al ₂ O ₃	O 7	3.5	010, bladed, h.in bauxite
Orthite	HPtO ₄	O 5½	4.29	y br to dk br, strk y br
Spinel	MgAl ₂ O ₄	I 8	4.0	h.octahedrons, vit
Magnetite	Fe ₃ O ₄	I 6½	5.18	Fe-blk, blk strk, mg
Franklinite	Zn(FeO ₂) ₂	I 6½	5.22	Fe-blk, dk br strk, blk mag
Chromite	Fe ₃ TiO ₄	I 5½	4.6	submet, strk dk br, Fe-blk
Heulandite	Na ₂ Al ₂ O ₅	O 6	3.95	0001, vit, strk
Columbite	(Fe,Mn)(Nb,Ta)O ₆	O 6	5.25	Fe-blk, strk submet
HALIDES				
Halite	NaCl	I 2	2.17	100, salty taste
Sylvite	KCl	I 2	1.99	100, bitter taste
Ceratite	AgCl	I 2½	5.56	sectoral, maxlike
Fluorite	CaF ₂	I 4	3.18	111, cubes, h
Carnallite	KMgCl ₃ ·6H ₂ O	O 2½	1.60	deliq, no cl
Cryolite	Na ₃ AlF ₆	M 2½	2.98	vit to greasy, "cubic" prtg
CARBONATES				
Calcite	CaCO ₃	R 3	2.71	h, 101, vit, HCl test
Magnesite	MgCO ₃	R 4	3.02	w, massive or 101, lag, h
Siderite	FeCO ₃	R 4	3.97	101, it, to dk br, lag
Rhodochrosite	MnCO ₃	R 4	3.70	pink, 101, h
Smithsonite	CaCO ₃	R 3½	4.48	h, 101, vit, chl HCl, h, ag
Aragonite	CaCO ₃	O 4	2.95	columnar, xh, h, ag
Wetherite	CaCO ₃	O 3½	4.29	sg, eff in chl HCl
Strontianite	CaCO ₃	O 3½	3.78	sg, eff in chl HCl, 5r, fm
Cerussite	PbCO ₃	O 3½	6.57	sg, ag, sub
Leadite	Fe ₂ CO ₃	M 4	2.80	200, bl, rhombic, alt, HCl test
Ankerite	(Ca,Fe,Mg,Mn)(CO ₃) ₂	M 4	3.02	like dolomite but y br to br
Malachite	Cu ₂ (CO ₃) ₂ (OH) ₂	M 4	4.07	brt, grn, eff in chl HCl
Azurite	Cu ₃ (CO ₃) ₂ (OH) ₂	M 4	3.78	azur, bl, eff in chl HCl
NITRATES AND BORATES				
Soda-niter	NaNO ₃	R 2	2.27	101, cool taste, deliq
Niter	KNO ₃	O 2	2.11	cool taste, non-deliq
Kernite	Na ₂ NO ₃ ·4H ₂ O	M 2½	1.91	001, 100, shiny clsg
Borax	Na ₂ B ₄ O ₇ ·10H ₂ O	M 2½	1.72	100, sweet alk taste, h
Ulexite	Na ₂ B ₄ O ₇ ·8H ₂ O	M 2½	1.96	100, cool, w, h, tasteless
Colemanite	Ca ₂ B ₆ O ₁₁ ·5H ₂ O	M 2½	2.43	010, exfoliated, heated
Boracite	MgAl ₂ B ₆ O ₁₁ Cl	O 7½	3.1	h, isometric sub
SULFATES				
Borate	BaSO ₄	O 3½	4.50	sg, 001, 100, sub, xh
Selenite	SrSO ₄	O 3½	3.98	sg, 001, 110, sub, xh
Angleite	PbSO ₄	O 3	6.39	sg, ag, sub, conch
Anhydrite	CaSO ₄	O 3½	2.98	100, 010, 010, 010
Gypsum	CaSO ₄ ·2H ₂ O	M 2	2.32	h, 010, 001, 111
Chalcocite	Cu ₂ S·4H ₂ O	Tr 2½	2.29	azur, bl, sub, taste
Pyrite	FeS ₂	M 2½	4.00	sg, ag, sub, taste
Episomite	MgSO ₄ ·7H ₂ O	O 2½	1.68	cap, ag, bl, taste
Antlerite	Cu ₂ (SO ₄) ₂ (OH) ₂	O 3½	3.08	grn, 010, non-eff in chl HCl
Alunite	KAl ₃ (SO ₄) ₂ (OH) ₆	R 4	2.9	massive, w.gr. or reddish
Jarosite	KFe ₃ (SO ₄) ₂ (OH) ₆	R 3½	3.26	y to grn, pale y
PHOSPHATES, ARSENATES AND VANADATES				
Monazite	(Ce,Lu,Y, Th)PO ₄	M 5½	5.4	res, y to r, br, 001, prtg
Apophite	Ca ₃ (PO ₄) ₂ (P,Cl,OH)	H 5	3.20	grism, h, grn, br, h, purp, c
Pyromorphite	Pb ₅ (PO ₄) ₃ Cl	H 4	7.08	res to ad, sg, grn, br, y, w, bld, 101, grn, h
Turquoise	Cu ₆ (Al ₂ Si ₆ O ₁₈) ₂ (OH) ₄	T 6	2.8	subh, 101, bl, bl, 101
Wavellite	Al ₂ Si ₆ O ₁₈ (OH) ₂ ·H ₂ O	M 4	2.33	subh, 101, bl, bl, bl, bl, bl
Tourmaline	Cu ₂ U ₃ (SiO ₃) ₂ (OH) ₂	T 2½	3.2	pale to dk gr, rad, 001
Autunite	Ca ₂ (UO ₂) ₂ (PO ₄) ₃ ·8H ₂ O	T 2½	3.2	y to grn, rad, bl y, gr, 001
VANADIUM OXYSLATE				
Carnotite	K ₂ (UO ₂) ₂ (VO ₄) ₂ ·nH ₂ O	M 2	5	y to grn, y, rad, 001
Tyuymomite	Ca ₂ (UO ₂) ₂ (VO ₄) ₂ ·nH ₂ O	O 2	3.62	y, rad, tan, grn in sun, 001
MOLYBDATES AND TUNGSTATES				
Huehnerite	MnWO ₄	M 4	7.2	res, sg, 010, transp
Wolframite	(Fe,Mn)WO ₄	M 4½	7.4	brn blk to Fe-blk, met-ad, sg, 010
Ferberite	FeWO ₄	M 4½	7.31	blk, met-ad, sg, 010
Scheelite	CaWO ₄	T 5	6.12	vit, ag, bl, bl, w, 101
Wulfenite	PbMoO ₄	T 3	7.0	tab, xh, y, or, r, gy, w, h

DATA SHEET 14
GEOLOGICAL SURVEYS
of the
WORLD

Data Sheet 14, Geological Surveys of the World, is being revised under the auspices of the AGI Data Sheet Committee. You are urgently requested to supply information on additions and corrections to the original sheet which appeared in *GeoTimes*, Vol. IV, No. 2, September, 1959. Send your data to American Geological Institute, 2101 Constitution Ave., N.W., Washington 25, D. C.

1959. To date more than 10,000 copies of this booklet have been distributed.

The fundamental purpose of the booklet is to inform recent graduates about the professional societies in the areas of geology-geophysics with the objective of encouragement of early professional alignment through membership in one or more AGI Member Societies. Professional geoscientists are also finding the booklet extremely useful as a directory of AGI Member Societies and society officers.

The Member Societies Of the AGI

A booklet describing briefly the Member Societies of the AGI, their objectives, history, publications and membership requirements is available free on request from the American Geological Institute 2101 Constitution Ave., N.W., Washington 25, D.C.

This booklet was published first in 1958. The second edition was published in June

AGI LONG RANGE CALENDAR OF SCHEDULED MEETINGS AT HOME AND ABROAD

NORTH AMERICAN MEETINGS

1961

Feb. 19-23—AIME: Annual Meeting, Chase and Park Plaza Hotels, St. Louis, Mo.

Mar. 5-10—ASP-ACSM: Annual Meeting, Shoreham Hotel, Washington, D. C.

Mar. 21-30—AMER. CHEM. SOC.: 139th Meeting, St. Louis, Mo.

April—SEVENTH NUCLEAR CONGRESS, Chicago, Ill.

April—OHIO ACAD. OF SCIENCE, Geol. Sect., Univ. of Cincinnati, Cincinnati, Ohio.

April 17-19—CIM: Annual General Meeting, Chateau Frontenac, Quebec City, Quebec.

April 23-27—ACers: 63rd Annual Meeting, Royal York Hotel, Toronto, Ontario.

April 24-27—AAPG-SEPM: 46th Ann. Meeting, Hilton Hotel, Denver, Colo.

May 25-26—AIME: Joint Meeting Rocky Mountain Petroleum Sects., Salt Lake City, Utah.

Sept. 3-8—AMER. CHEM. SOC.: 140th Meeting, Chicago, Ill.

Oct. 8-11—AIME: Soc. of Petroleum Engrs., Fall Meeting, Dallas, Texas.

Oct. 25-27—GULF COAST ASSOC. OF GEOL. SOC'S.: Meeting, San Antonio, Texas.

Nov. 2-4—GSA: Ann. Meeting, Cincinnati, Ohio.

Nov. 5-9—SEGP: 31st Ann. Internat. Meeting, Denver, Colo.

Dec. 26-31—AAAS: Ann. Meeting, Denver, Colo.

1962

Feb. 18-22—AIME: Ann. Meeting, New York City.

Mar. 11-17—ACSM-ASP: Ann. Meeting, Shoreham Hotel, Washington, D. C.

Mar. 20-29—AMER. CHEM. SOC.: 141st Meeting, Washington, D. C.

Mar. 26-29—AAPG-SEPM: 47th Ann. Meeting, Civic Auditorium, San Francisco, Calif.

April—EIGHTH NUCLEAR CONGRESS, San Francisco, Calif.

April 23-25—CIM: Annual General Meeting, Chateau Laurier, Ottawa, Ont., Canada.

April 29-May 3—ACers: 64th Ann. Meeting, New York City.

May 7-8—AIME: Soc. of Petroleum Engrs., 5th Biennial Secondary Recovery Symposium, Wichita Falls, Texas.

May 24-25—AIME: Soc. of Petroleum Engrs., Ann. Joint Meeting, Rocky Mountain Petroleum Sects., Billings, Mont.

Sept. 9-14—AMER. CHEM. SOC.: 142nd Meeting, Atlantic City, N. J.

Sept. 17-20—SEGP: 32nd Ann. Internat. Meeting, Calgary, Alta., Canada.

Oct. 7-10—AIME: Soc. of Petroleum Engrs., Fall Meeting, Los Angeles, Calif.

Oct. 31-Nov. 3—GULF COAST ASSOC. OF GEOL. SOC'S.: New Orleans, La.

Nov. 12-14—GSA: Annual Meeting, Houston, Tex.

Dec.—AAAS: Ann. Meeting, Boston, Mass. (tentative)

1963

Feb. 24-28—AIME: Ann. Meeting, Dallas, Tex.

Mar. 24-29—ASP-ACSM: Ann. Meeting, Shoreham Hotel, Washington, D. C.

Mar. 25-28—AAPG-SEPM: 48th Ann. Meeting, Coliseum, Houston, Tex.

Mar. 31-April 5—AMER. CHEM. SOC.: 143rd Meeting, Los Angeles, Calif.

April 22-24—CIM: Ann. General Meeting, The McDonald Hotel, Edmonton, Alta., Canada.

April 28-May 2—ACers: 65 Ann. Meeting, Pittsburgh, Pa.

May 23-24—AIME: Soc. of Petroleum Engrs., Joint Meeting, Rocky Mountain Petroleum Sects., Denver, Colo.

Sept. 8-13—AMER. CHEM. SOC.: 144th Meeting, New York City.

Oct. 6-9—AIME: Soc. of Petroleum Engrs., Fall Meeting, New Orleans, La.

Oct. (tentative) —AIME: Soc. of Petroleum Engrs., Meeting, Los Angeles, Calif.

Oct. 20-24—SEGP: 33rd Ann. Internat. Meeting, Roosevelt and Jung Hotels, New Orleans, La.

Nov. 13-16—GULF COAST ASSOC. OF GEOL. SOC'S.: Ann. Meeting, Hot Springs, Ark.

Dec.—AAAS: Ann. Meeting, Milwaukee, Wis.

1964

Feb. 16-20—AIME: Ann. Meeting, New York City.

March 15-21—ACSM-ASP: Ann. Meeting, Shoreham Hotel, Washington, D. C.

March 21-April 9—AMER. CHEM. SOC.: 145th Meeting, Philadelphia, Pa.

May 4-5—AIME: Soc. of Petroleum Engrs., Meeting, Wichita Falls, Tex.

May 4-7—AAPG-SEPM: 49th Ann. Meeting, Detroit, Michigan.

Aug. 30-Sept. 4—AMER. CHEM. SOC.: 146th Meeting, Chicago, Ill.

Oct. 4-7—AIME: Soc. of Petroleum Engrs., Fall Meeting, Houston, Texas.

Oct.—AIME: Soc. of Petroleum Engrs., Meeting, Los Angeles, Calif.

—GULF COAST ASSOC. OF GEOL. SOC'S.: Ann. Meeting, Corpus Christi, Texas.

1965

Feb. 14-18—AIME: Ann. Meeting, Chicago, Ill.

Mar. 29-April 3—ASP-ACSM, Ann. Meeting, Shoreham Hotel, Washington, D. C.

April 26-29—AAPG-SEPM: 50th Ann. Meeting, Municipal Auditorium, New Orleans, La.

May—AIME: Soc. of Petroleum Engrs., Meeting, Salt Lake City, Utah.

Sept. 12-17—AMER. CHEM. SOC.: 148th Meeting, Atlantic City, N. J.

Oct. 3-6—AIME: Soc. of Petroleum Engrs., Fall Meeting, Dallas, Texas.

—GULF COAST ASSOC. OF GEOL. SOC'S.: Ann. Meeting, Houston, Texas.

1966

Feb. 14-18—AIME: Ann. Meeting, New York City.

LONG RANGE CALENDAR

This calendar has been prepared for several years by the AGI to aid in planning and scheduling of scientific meetings in geology and related sciences. Previously its distribution has been limited.

Henceforth, this calendar will be published twice a year in *GeoTimes*. We urge all concerned to provide concisely stated meeting notices for this calendar as soon as meeting dates become known.

Mrs. Kathryn Lohman
GeoTimes Calendar Editor
 2101 Constitution Ave., N.W.
 Washington 25, D. C.



W. D. Johnston, Jr., Chief, Branch of Foreign Geology, U.S. Geological Survey, responding to the presentation of the Jose Bonifacio de Andrade e Silva medal of the Sociedade Brasileira de Geologia at the XIII Congresso Brasileiro de Geologia held in Sao Paulo on November 14, 1959. Dr. Glycon de Paiva made the presentation. The medal is awarded for progress and stimulation of the geological sciences on Brazilian soil. Left to right in the above photograph are Dr. Joao Citovalo Cardoso, President of the Brazil National Resources Council, Dr. Viktor Leinz, President of the Geological Society of Brazil and Dr. Johnston.

INTERNATIONAL MEETINGS 1960

July 11-18 — WORLD CONFERENCE ON EARTHQUAKE ENGINEERING, 2nd: Science Council of Japan in cooperation with the Japan Society of Civil Engineers, the Architectural Institute of Japan, and the Seismological Society of Japan. Prof. Kiyoishi Muto, Chairman, Organizing Committee, Science Council of Japan, Ueno Park, Taito-Ku, Tokyo, Japan.

July 25-Aug. 6—INTERNAT. ASSOC. OF PHYSICAL OCEANOGRAPHY, 13th General Assembly, in conjunction with 12th Gen. Assembly, IUGG, Helsinki. Prof. B. Kullenberg, Sec'y. of the Assoc., c/o Oceanografiska Institutet, P.O. Box 1038, Goteborg 4, Sweden.

July 25-Aug. 6—INTERNAT. UNION OF GEODESY AND GEOPHYSICS, 12th General Assembly, together with a large number of joint and separate meetings of the Union's Constituent associations, Helsinki, Finland. Organizing Comm. for the 12th Gen. Assembly, Institut Geodesique, Bulevardi 40, Helsinki.

July 27—SYMPORIUM ON VARIATION IN THE OVERFLOW OF SUBMARINE RIDGES: Internat. Assoc. of Physical Oceanography, Helsinki, Finland. Prof. B. Kullenberg, Sec'y. of the Assoc., c/o Oceanografiska Institutet, P.O. Box 1038, Goteborg 4, Sweden.

July 28—ISLAND ARCS SYMPOSIUM: Internat. Assoc. of Seismology and Physics of the Earth's Interior with the cooperation of the Internat. Assoc. of Geodesy and Internat. Assoc. of Volcanology, Helsinki, Finland. In connection with 12th Gen. Assembly of IUGG. Prof. J. P. Rothe, Sec'y., Internat. Assoc. of Seismology & Physics of the Earth's Interior, 38, boul. d'Anvers, Strasbourg, France.

July 28-29—SYMPORIUM ON TIDAL RIVERS: Internat. Assoc. of Scientific Hydrology and Internat. Assoc. of Physical Oceanography, Helsinki, Finland. In connection with the 12th General Assembly of IUGG. Prof. L. J. Tison, Sec'y., Internat. Assoc. of Scientific Hydrology, 61, rue des Rones, Gentbrugge, Belgium.

July 29—SYMPORIUM ON THE TOPOGRAPHY, MORPHOLOGY, AND GEOLOGY OF THE OCEAN FLOOR: Internat. Assoc. of Physical Oceanography with the participation

of the Internat. Assoc. of Seismology and Physics of the Earth's Interior, Helsinki, Finland. In connection with the 12th Gen. Assembly of IUGG. Prof. B. Kullenberg, Sec'y., Internat. Assoc. of Physical Oceanography, c/o Oceanografiska Institutet, P. O. Box 1038, Goteborg 4, Sweden.

SYMPORIUM ON THE RELATIONSHIP OF VOLCANOES AND "PLUTONS": Internat. Assoc. of Volcanology, Helsinki, Finland. In connection with the 12th Gen. Assembly of IUGG. Prof. F. Signore, Sec'y. of the Assoc., 199, via Tasso, Naples, Italy.

Aug. 15-24—INTERNAT. UNION OF CRYSTALLOGRAPHY, Gen. Assembly and Internat. Congress, 5th, Cambridge, England. Followed by two Symposia, Aug. 22-24. Dr. D. W. Smits, Gen. Sec'y. of the Union, c/o Lab. of Inorganic and Physical Chemistry, 10 Bloem singel, Groningen, Netherlands.

Aug. 6-13—INTERNAT. GEOGRAPHICAL CONGRESS, 19th, Stockholm, Sweden. Also 10th Gen. Assembly of the IGU and meetings of the IGU Commission, Organizing Committee, Postfack, Stockholm 6, Sweden.

Aug. 15-25—INTERNAT. GEOLOGICAL CONGRESS, 21st, Copenhagen, Denmark. Theodor Sørensen, Gen. Sec'y., Danmarks Geologiske Undersøgelse, Geologiske Rigsinstitut, Charlottenlund, Denmark.

Aug. 15-25—INTERNAT. PALEONTOLOGICAL UNION, Meeting, Copenhagen, Denmark. In connection with 21st Internat. Geol. Cong., 5th INTER-COLLOQUIUM ON MICROPALEONTOLOGY also tentatively scheduled in connection with the Congress. Dr. Jean Roger, Service d'Information Géologique, B.R.G.M., 74, rue de la Fédération, Paris 15, France.

Aug. 15-25—INTERNAT. SEDIMENTOLOGICAL CONGRESS, 6th, Copenhagen, Denmark. In connection with the 21st Internat. Geol. Cong. Secretary General, Internat. Assoc. of Sedimentology, c/o Institut Francais du Petrole, 4, Place Bir Hacheim, Rueil-Malmaison (S-E-O) France.

Aug. 22-24—INTERNAT. UNION OF CRYSTALLOGRAPHY, SYMPOSIA, Cambridge, England. Follows the Union's 5th Gen. Assembly and Internat. Cong. Dr. W. H. Taylor, c/o Crystallographic Laboratory, Cavendish Laboratory, Cambridge, England.

August—INTERNAT. COLLOQUIUM ON MICROPALAEONTOLOGY, 5th, Copenhagen, Denmark. In connection with 21st Internat. Geol. Cong. and Internat. Paleontol. Union. Prof. Ardito Desio, c/o Istituto di Geologia, Università di Milano, Milan, Italy.

Sept. 5-17—INTERNAT. CONGRESS OF PHOTOGRAFOMETRY, 9th, London, England. Col. J. B. P. Angwin, Congress Director, 18 Cavendish Square, London, W. L., England.

Nov. (2nd week)—PAN INDIAN OCEAN SCIENCE ASSOC., Congress, Karachi, Pakistan. Dr. M. Q. Khuda, Congress Sec'y., Director, East Regional Laboratories, Pakistan C.S.I.R., Polytechnic Institute, Tejgaon, Dacca, East Pakistan.

SYMPOSIUM ON GEOCHEMISTRY, Gottingen, Germany. Internat. Union of Pure and Applied Chemistry, Section of Inorganic Chemistry, Commission on Geochemistry, Prof. Dr. C. W. Correns, Sedimentpetrographisches Institut, Lotzestrasse 13, Gottingen, Germany.

1961

June—WORLD METEOROLOGICAL ORGANIZATION, Regional Assoc. III (South America), Session 3rd, Rio de Janeiro, Brazil. Campagne Rigot, Av. de la Paix, Geneva, Switzerland.

Aug. 21-Sept. 2—PACIFIC SCIENCE CONGRESS, 10th, Honolulu, Hawaii. Pacific Science Assoc. Secretary General, 10th Pacific Sci. Cong., Bishop Museum, Honolulu 7, Hawaii.

August—INTERNAT. COUNCIL OF SCIENTIFIC UNIONS, 9th General Assembly, England or Portugal. National Academy of Sciences-National Research Council, Washington 25, D.C.

TEXAS A & M SPONSORS PROGRAM IN GEOLOGY FOR SCIENCE-INTERESTED HIGH SCHOOL STUDENTS

Here is your chance to do something about the quality of students interested in geology.

Is that high school student next door to you a boy of exceptional ability? Does he have an exceptional scholarship record? Has he a sustained interest in science? Then we would appreciate your bringing the following information to his attention. The National Science Foundation is supporting at the A. & M. College of Texas a summer science training program for 36 secondary school students: "Science and Engineering Related to Geology," a five-week program from June 13 through July 15, 1960.

The main objectives of the program will be to help motivate students of high ability to careers in science or engineering and to develop deductive reasoning as a thinking process.

All students who have completed grade 10 will be eligible, although some preference will be given to applicants who have completed one year of high school chemistry.

Fifty hours of lecture will be given on the material composing the earth, agents and processes shaping the surface of the earth, the demands of space-age technology on geology, and the relationship between geology and other sciences and engineering fields. Included in these lectures will be 10 to 15 lectures by visiting scientists and engineers working in geology and other fields.

Laboratory studies of minerals, rocks, fossils, and physiographic maps will occupy about eleven afternoons. Visits to scientific laboratories will take about eight afternoons and one full day, and will include observation and explanations of electron microscopes, X-ray diffraction, X-ray spectrograph, emission spectrograph, mass spectrometer, nuclear reactor, meteorology radar, asphalt and concrete laboratories, analog computer, and computor center, and petroleum research laboratories. A visit will be made to an oil equipment manufacturing company plant and an oil company research laboratory.

Geologic field trips will involve local

CONGRESS

news and information on the

INTERNATIONAL
GEOLOGICAL CONGRESS
NORDEN

August 15-25 1960

U. S. geologists attending the International Geological Congress won't be the only people going to Europe this summer. The State Department estimates a bumper crop of travelers this coming summer due in part to many international meetings and the Olympic Games.

The State Department's Passport Office expects 5200 passport applications daily in March, April and May. They have streamlined passport processing with a teletype system which connects offices throughout the country with the main office in Washington. This and other new procedures, including a new application form, have cut down average processing time to about three days. Nevertheless, with an estimated 800,000 Americans filing for passports in the current year, Congress travelers should not wait until the eleventh hour to apply for a passport.

If you are planning to buy or rent and drive a car in Europe, you should make application to the American Automobile Association, Inc., 250 Park Ave., New York 17, N. Y., for an International Driving Permit. The application form must be accompanied by evidence of a valid U. S. (state) driver's license, two passport-type photographs and \$4.00. These permits are not issued to persons under age 18.

By summer most, if not all, airlines will have dropped the surcharge which has been in effect on jet flights.

trips, a two-day trip to the East Texas Oil Field and the Grand Saline Salt Mine, and a three-day field trip to the Central Mineral Region of Kimble, Mason, San Saba and Llano counties.

The estimated cost for each student will be about \$150.00 for which the NSF has provided partial support. Application for the program in Texas may be made through the student's High School Science Teacher or school official in cooperation with the Texas Education Agency. Applications from other states will be processed through the Director of the program. Additional information may be obtained by writing the Director, Dr. M. C. Schroeder, Department of Geology and Geophysics, A. & M. College of Texas, College Station, Texas.

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Popular Geology in Print

by Mark W. Pangborn Jr.

An attractive new layman's guide to the origins of the American landscape is geologist *John A. Shimer's* *THIS SCULPTURED EARTH* (Columbia U. Press, 1959, \$7.50). Six chapters are devoted to landscape types; for example "Edge of the land" describes our coasts, "The legacy of the glaciers" explains the glaciation of New England and the origin of Yosemite, and "Mountain scenery" deals with the Appalachians, Tetons, and Big Horns. Two concluding chapters summarize the principles of surface and ground water erosion; there are numerous fine photos, occasional maps and diagrams, and an illustrated glossary. It is difficult to criticise such an intelligently conceived and well-written volume, but your reviewer wishes that Shimer had extracted a lot more block diagrams from his talented artist-wife, and had provided an annotated bibliography to take the interested reader to the growing popular literature.

A useful new title is *Roy Eberhart's COLORADO GHOST TOWNS AND MINING CAMPS* (Sage Books, 2679 So. York, Denver 10, Colo., 1959, \$6.50). This is the first comprehensive guidebook, listing nearly 1000 places—of which only 100 are still inhabited—and is replete with historical and mining lore; unfortunately, the maps are miserable and the numerous photos poorly reproduced; no bibliography.

Another Colorado item, dealing with the history of the famed Climax Molybdenum Mine, is *GRAY GOLD* (Big Mountain Press, 2679 So. York, Denver 10, Colo., 1959, \$4), by *Otis Archie King*; claim jumping and other tribulations fill the pages of this rather personal account by one of the principal parties involved.

In Rock to Riches (Southwest Publishing Co., 817 W. Madison St., Phoenix, Ariz., 1959, \$8.75), the mining history of Arizona is lovingly traced from Spanish times to 1957 by engineer *Charles H. Dunning*, who was personally involved in much of it. Metal mining naturally gets fullest treatment, and Dunning provides an annotated list of some 250 notable mines, statistical tables, and a brief glossary, but no bibliography.

We are glad to see the second edition of *Williams Haynes' BRIMSTONE, THE STONE*

CLAY CONFERENCE

AT PURDUE

Oct. 5-8, 1960

The Ninth National Clay Conference, sponsored by the Clay Minerals Committee of the National Academy of Sciences-National Research Council, will be held at Purdue University, Lafayette, Indiana, on October 6, 7 and 8, 1960. In addition a short field trip and laboratory visits are planned for Wednesday, October 5. All those interested in research or technology in fields related to clays or clay minerals are cordially invited to participate.

Two special symposia of invitational papers are planned on the subjects of "Engineering Aspects of Physico-Chemical Properties of Clays" and "Clay-Organic Complexes." The symposium on "Engineering Aspects of Physico-Chemical Properties of Clays" will feature contributions on soil mechanics. The "Clay-Organic Complexes" symposium will be concerned with basic studies of clay-organic systems in the paper and petroleum industries, in soil science, civil engineering, and other areas. In addition, there will be general sessions and original contributions on any aspect of clay mineralogy are invited.

Titles and abstracts of contributions to the general sessions should be submitted to Dr. J. L. White, Agronomy Department, Purdue University, Lafayette, Indiana, by June 1, 1960. Abstracts should be limited to 250 words and should be informative rather than descriptive. Abstracts should be submitted in duplicate.

A short field excursion is planned in the immediate vicinity of Lafayette to examine well-characterized soil profiles and geological features of the area. Guided tours through the Purdue University Soil Mechanics and Highway Research Project Laboratories as well as the Soil Chemistry and Soil Mineralogy Laboratories of the Agronomy Department are planned for Wednesday, October 5.

For further details write: Dr. J. L. White, Local Chairman, Ninth National Clay Conference, Agronomy Department, Purdue University, Lafayette, Indiana.

THAT BURNS (Van Nostrand, 1959, \$5.95); long out of print, this is an expert history of the Frasch sulphur industry in America, with an appendix of production tables and an extensive bibliography.



William E. Wrather, former Director of the U. S. Geological Survey and outstanding petroleum geologist, recently was made an Honorary Member of the American Institute of Mining, Metallurgical and Petroleum Engineers "in recognition of his outstanding contributions to the profession as pioneer petroleum geologist and discoverer of the Desdemona Field and his distinguished service to the public as Director of the United States Geological Survey in times of war and peace."

New Seamount Found

Geoscientists aboard the Columbia University oceanographic vessel VEMA recently reported a 15,980-foot cone-shaped "seamount" rising to within 120 feet of the ocean's surface in the South Atlantic, 550 miles west of the Cape of Good Hope, South Africa.

The cone is 35 miles broad at the base and about 5 miles wide at the top, a platform which is only about 200 feet below the surface of the ocean. The Vema scientists reported large associated magnetic anomaly suggesting the volcanic nature of the cone which appears to tie in with a subsurface chain of volcanic cones in the South Atlantic. During the Pleistocene it is believed, this seamount stayed well above sea level.

The present Vema cruise is expected to provide new and significant evidence relating to active turbidity currents.

Walter H. Munk and Gordon J. F. MacDonald Honored for Monographs

In past issues of GeoTimes the Academy Monograph Prize contests of the American Academy of Arts and Sciences have been announced. The prizes, awarded annually, serve to encourage and assist the publication of scholarly contributions to knowledge which might otherwise go unpublished.

President of the Academy, Kirtley F. Mather recently announced the awarding of the three Monograph Prizes. The recipients were selected from a field of more than 500 entries. In the physical and biological sciences the award was made to Professors Walter H. Munk and Gordon J. MacDonald of the University of California for their Monograph, *The Rotation of the Earth*.

Entries for the 1960 competition must be submitted before October 1, 1960. (GeoTimes, Nov.-Dec. p. 34).

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AAPG-SEPM MEETING

(Continued from page 16)

Ridge trend. The province can be subdivided into a western Ridge and Valley section and an eastern Great Valley section, the latter being locally named at various places along its trend.

Sediments exposed in this province range from Pennsylvanian to Cambrian. Structurally the area is complicated, from fairly open to closely-folded anticlines and synclines of the northern area to the intricately faulted section to the south. Although various parts of the Paleozoic can be tested at shallow depths in one part of the province or another, little drilling has been done. Reluctance to explore the area is no doubt caused by the apparently more attractive Plateau objectives and an apprehension concerning the severe deformation with extensive fracturing or metamorphism and a loss of oil and gas. Objections to these apprehensions have been discussed by Price (Appal. Region Deep Prospects Sympos., 1949).

An important structural trend in the Ridge and Valley and northeastern Plateau areas is the Adirondack-Tazewell arch (Kay, 1942; Woodward, 1954). Facies and thickness changes accompanying this feature are of much significance to the petroleum geologist.

Within the province, commercial quantities of gas have been found in the Lower Devonian of Rockingham County, Virginia, Hampshire County, West Virginia, and Bedford County, Pennsylvania. Mississippian gas has been produced in Scott and Washington Counties, Virginia, and the Trenton limestone of Lee County, Virginia, has produced oil in a fenster located within the Cumberland overthrust block. Gas or oil shows have been found in strata ranging from Devonian to Cambrian in a number of unproductive wells which have been drilled in the province.

The Ridge and Valley Province must be included in our oil and gas exploration planning. Exploration will be difficult because of structural complexity. The surface and/or near surface structural details may be superficial, and in some areas they may not represent the attitude at depth. Some exploration means must be found to accurately probe the structures ahead of drilling. The seismograph may be the needed tool although there is some question if this method, at its present stage of development, is adequate to economically explore the complicated structures of the province.

ATLANTIC COASTAL PLAIN PROVINCE

This province, extending from the Fall

Line to the edge of the Continental Shelf, includes sediments from Quaternary to Triassic. The thickness of these beds ranges from zero at the Fall Line to 15,000 feet or more at the edge of the Shelf. Few tests have been drilled, and of these, hydrocarbon shows are very scarce. Nevertheless, other factors indicative of a petroleum province must be present—sediments with unconformities, facies changes, up dip permeability wedges. Although the structure of the Coastal Plain is chiefly homoclinal, local and regional anomalies are present (Richards, 1945, p. 953).

Of the several oil and gas frontiers of the northeastern United States, the Atlantic Coastal Plain is receiving the least attention. Yet here is a huge area where drilling the entire sedimentary section will be mainly shallow, and the less indurated rocks, as compared with the Appalachian Plateau and Ridge and Valley Provinces, are easily penetrated. In addition to favorable geologic and drilling development factors, the closeness of the area to the abundant northeastern United States markets, gives this Province an economic edge over the inland Appalachian area.

EPILOGUE

The author does not want to close this review without a digression on a hackneyed subject, but still a matter pertinent to oil and gas exploration in the northeastern United States as well as any other areas.

In the last few years we have been hearing much about the skyrocketing costs of oil and gas exploration and production. The percentage increases in costs in these two areas has far outpaced, to an alarming degree, the costs in other phases of the industry. Some of the blame for these increased costs can be laid at the doorstep of the geologist. As in other fields, we are becoming more and more specialized, experts in our own little domain. We see only a narrow part of the total exploration effort, a view described by someone as "tunnelvision". This situation is not always of the geologist's making, although there are *prima donnas* among us. More often, perhaps, the geologist does not have the opportunity to spread out because of organizational setups, or enmities between the geologists and geophysicists.

Leverson has said we need more of a rare breed he calls "generators" or integrator geologists, men who can combine a variety of data and generate a drilling prospect. We certainly need more of this kind of man, but we require something additional. This need is closer liaison and

cooperation between the geologist and geophysicist and, yes, with the drilling-production man, too. Many of us can think of particular situations where this cooperation was lacking with, in some cases, costly economic consequences. The law of diminishing returns often applies where an organization builds up a staff of highly trained experts, tops in their field, but accompanying this there may be a falling off of integration of ideas and data, and lessening of cooperation between departments.

Going back to the subject under discussion, although the Northeastern United States has numerous attractive oil and gas prospects, some of the frontiers involve unravelling geology of more than average difficulty. Exploration costs can be high. It behooves the geologist to work closely with his fellows engaged in exploration and development in order to attain optimum efficiency of effort.

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ICE CAP I. 16 mm. Sound. Black and white. 31 minutes. 1953. *Reviewed by Wakefield Dort, Jr.* Here is the story of a search for practical and effective means of transporting sleds, tractors and other heavy equipment across the Greenland ice-cap. First comes a short 17-mile trip into the marginal zone of the ice east of Thule, followed later by an 800-mile traverse to the northern coast of Greenland and back. Many details of equipment operation, methods of travel, geophysical studies, and ice-cap features are shown. This is a documentary film which emphasizes the technical aspects of ice-cap travel, and is best suited to college level audiences interested in glacial exploration. DISTRIBUTOR: *Transportation Corps, U. S. Army*.

ICE CAP II. 16 mm. Sound. Black and white. 28 minutes. 1954. This pictorial summary of Army research expeditions onto and along the margins of the Greenland ice-cap shows some of the many special types of vehicles developed for such areas, and the geology, glaciology and meteorology that were studied within 200 miles of Thule, Greenland. This documentary film emphasizes technical aspects of the projects and is best suited to college level audiences interested in ice-cap glaciology and transportation. DISTRIBUTOR: *Transportation Corps, U. S. Army*.

TERRA INCOGNITA. 16 mm. Sound. Black and white. 29 minutes. After re-viewing man's attempts to magnify the very small, from van Leeuwenhoek's crude lenses to modern achromatic objectives, which function with both regular and short wave lengths of light, this film traces the development of the electron microscope, showing diagrammatically the principles upon which it operates, and some of the areas of research (including earth science) in which it is currently used. For college and advanced high school classes studying microscopy. DISTRIBUTOR: *Philips Electronics Inc., Instruments Division, 750 S. Fulton Ave., Mt. Vernon, New York*.

WALKER, F. H. (1957), *A Summary of Drilling and Production From Cambrian and Ordovician Beds in Kentucky*, Amer. Pet. Inst., Paper 826-28-J.

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LETTERS

DEAR EDITOR:

In the past few issues of GeoTimes there has been a preponderance of comments concerning basic training in geology, over-production of graduating geology majors, etc. I, among many, wish to concentrate on quality rather than quantity of both undergraduates and graduates. Some universities have as many as 80 graduates. This situation, with staffs of only 10 instructors, is ridiculous—just plain ridiculous—from the standpoint of giving the adequate training demanded today for research and applied geology. So, it is suggested that to eliminate or at least minimize this situation that such courses as Physical Chemistry, Physics (including Atomic), Thermodynamics, Analytical Mechanics, Strength of Materials, Hydraulics, and Calculus be required before Masters Degree is granted. Believe me, the quality of our new men entering the profession will be greatly strengthened. There are many good geologists who have never been exposed to these academic courses but there is little doubt that they would have been better had they known the fundamentals.

Sincerely,
L. W. LEROY
Colorado School of Mines

MRS. BONNIE C. HENDERSON
AGI Register Supervisor

I wish to extend my compliments to you on the new 1960 edition of the Directory of Geoscience Departments, of which you were editor. It is a fine job and a great improvement over the previous edition.

Sincerely yours,
WAKEFIELD DORT, JR.

EDITOR'S COMMENT: This is typical of many comments we have received about the new AGI Report 11 (\$2.00) which contains much valuable data such as a complete run-down on all departments of geology-geophysics—the faculty, courses offered, degree requirements. It also contains a list of faculty members, and tables providing pertinent data on geology summer camps. This report will help students, faculty, company recruiters and practicing geoscientists. ORDER YOUR COPY TODAY.

DEAR EDITOR:

Although I am not qualified to dispute the decision of the Wage and Hour board as reported in Dr. Meyerhoff's column in

the September issue, I feel that as a senior in the University of Colorado School of Law, and having received my BA in Geology, I should make some comment on the applicability of the Wage and Hour Act to Geologists.

As I understand from Dr. Meyerhoff's column the geologists in question were employed by a consulting firm, and were engaged in logging a client's wells. It is not new for the Act to be construed so as to cover such "independent contractors." In point of fact the Fair Labor Standards Act is not even the broadest extension of the federal commerce power. Many other acts reach even farther into the individual's back pocket.

Actually the key to this section of the Act pertinent to Dr. Meyerhoff's comments is the phrase "directly essential." Certainly the geologists in question were directly essential to the production of oil for commerce, and the courts have held that where the independent contractor's business was a special effort to meet the needs of the producers, then employees of the contractor may well be covered (See *Casa Baldrich Inc. v. Mitchell*, 214 F.2d (1st Cir. 1954)) and (*Walling v. Amidon*, 153 F.2d 159).

Whether or not the geologists in question were performing such professional duties as to be within the exemptions of the act I cannot say. This area has traditionally been one of subjective judgment of the courts and the Wage-Hour Board. It is doubtful if there is much the profession could do to change their opinion.

Finally, I do not feel that there is any necessity for, as Dr. Meyerhoff puts it, lawyers and bureaucrats to make all the rules and definitions, but until the federal government sees fit to place a man from every profession and every position in the economy on the Wage and Hour Board it seems that the geologists will have to be content to exercise their right to lobby for recognition and hope for the best. Perhaps all federal agencies would do a better job with two or three thousand leaders; it is more likely that they would do a still better job if their constituents would follow the democratic process of talking to their congressman.

Sincerely,
KARL F. ANUTA

DEAR EDITOR:

The article by Prof. Fan in the Nov.-Dec. issue can be considered as interesting, alarming, pessimistic, idealistic or downright nonsense according to the attitude of the reader. Personally, my own reaction was one of "I told you so."

After the War I held Visiting Professorships in two or three American universities and learned thereby what was going on in these educational factories. An unwritten, unspoken attitude was Kilroy deserved something from the folks back home, and hence let's go easy with the chap, for if we fail him he'll only be back next year. The insidious attitude that everyone is worthy of a college education, became compounded with the notion that bravery before the enemy should receive a university diploma as a citation.

Results were as one would expect. Teeming herds of mediocre students poured forth from Commencement Halls and away into the wild blue wonder of industry, commerce, teaching, etc. Employment was not difficult to obtain, and to fill the many vacancies not always could the employer rigorously maintain his standards.

There was, is, and always will be one perfectly simple way of controlling numbers admitted to the professions. Flunk them at college, no matter whether 1st year student or Ph.D. candidate. (Of all the many statistics compiled, I have yet to see one showing the number of doctoral candidates failed annually in the States.) Let there be less namby-pambyism, less coddling, less fear of the Head, the Dean, the President, the Board, the Football Coach, the politicians, the dear Mums and darling babies.

The examiner's red pencil line separates the first second-rate from the second first-rate countries of the world.

Your truly,
RAOUL C. MITCHELL-THOME
44 Ave. de Roma, 1E/F
Lisboa, Portugal

DEAR SIR:

Thomas W. Fluhr has hit a point in dealing with the problem of unemployment among geologists that should be emphasized. Before we can sell "geologists" to either the public or to future employers, someone must answer two questions:

1. What is a geologist?
2. What practical service can he render?

At present "geologist" is as indefinite as the U.S. foreign policy. We know what

he is supposed to be, but no one can predict what he actually is or what he will do.

We have men with engineering, science, and arts degrees at all academic levels. All are geologists, but there is a terrific difference in the potential usefulness to an employer. This wide variation in both academic background and experience should be defined in a series of professional classifications based on written or oral examination by a board appointed within the professional society.

Such a program would require effort and organization, but it would cure many ills.

1. It would standardize and define professional standings among geologists.
2. The examination for advanced standings would give geologists in the field incentive to continue to study and keep their tools sharp.
3. It could be an answer to the controversial licensing issue.
4. It would give a prospective employer a yard-stick by which to estimate the potential of a prospective employee.

In summary, the cures for employment troubles of geologists lie with both the professional societies and with individual geologists. The societies should encourage professionalism through setting standards to guide both geologists and employers. Individuals should help themselves by striving to conform to those standards and by emphasizing usefulness and creative ideas in their writing and in performance of their duties.

We have to sell "geology" as a profession. Our product should be both useful and of dependable quality.

Sincerely,
E. O. BRACKEN

Muskeg Conference

April 20-21

Calgary, Alberta, will be the site of the sixth annual meeting of the Muskeg Research Conference, April 20-21, under the sponsorship of the Associated Committee on Snow and Snow Mechanics of the National Research Council of Canada. The conference, as in the past, will afford the opportunity for those with a common interest in muskeg to meet and discuss mutual problems.

For information write: *I. C. MacFarlane, c/o Division of Building Research, National Research Council, Ottawa 2, Canada.*

Two Prominent Geoscientists Die

BENO GUTENBERG, world-famous authority on geophysics and seismology died in Pasadena, California, on January 25 at the age of 70. Professor Gutenberg was director of the California Institute of Technology Seismological Laboratory until his retirement two years ago. He was a member of the National Academy of Sciences and the American Academy of Arts and Sciences. He was a past-president of the Seismological Society of America. In 1933 he was the AGU Bowie Medalist and received the LaGrange Prize of the Royal Belgian Academy.

GEORGE W. STOSE, compiler of the first geologic map of the United States (1932) died on January 30 in Arlington, Virginia, at the age of 90. He served as editor of geologic maps for the United States Geological Survey from 1898 until his retirement in 1943. In addition to guiding numerous important geologic map compilations, Dr. Stose published results of many of his own field mapping projects in the Appalachian areas.



Richard H. Jahns on July 1 will become the new chairman of the Division of Earth Sciences, College of Mineral Industries, Pennsylvania State University, succeeding O. F. Tuttle who recently became dean of the College of Mineral Industries (GeoTimes, Nov.-Dec. 1959, p. 17). Dr. Jahns comes to University Park from the California Institute of Technology where he has been a member of the faculty since 1948.



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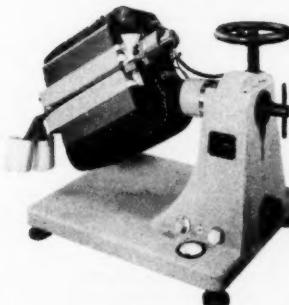
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GEOCHEMICAL METHODS OF PROSPECTING AND EXPLORATION FOR PETROLEUM AND NATURAL GAS by A. A. Kartsev, Z. A. Tabasaran'skii, M. I. Subbota, and G. A. Mogilevskii. Translated from the Russian by the California Research Corporation; English Translation edited by Paul A. Witherspoon and William D. Roney and published by the University of California Press, 1959. \$12.50.

A comprehensive and valuable treatment of the chemistry of petroleum origins and accumulations and the theory and application of geochemistry as applied to petroleum finding and evaluation. The work was published in Russian in 1954. The 14 chapters include "Oil and Gas Logging" and "The Role of Geochemical Methods in Petroleum Prospecting."

D. B.

OCEANOGRAPHY 1960 TO 1970: Part 3 Ocean Resources, A report by the Committee on Oceanography, 30 pp., 1959, National Academy of Sciences, 2101 Constitution Ave., N. W., Washington 25, D. C. (Obtainable on request from Committee on Oceanography)

Discusses biological and mineral resources of ocean and recommends research program. This is one of 12 chapters prepared by the Committee covering all phases of oceanography.

STRUCTURAL METHODS FOR THE EXPLORATION GEOLOGIST, by Peter C. Badgley, 280 pp., 1959, published by Harper & Brothers, 49 E. 33d St., New York 16, N.Y. \$7.50.

Primarily intended as a field and office manual for the practicing geologist. The book will undoubtedly find considerable use as an advanced classroom text in structural geology. Solutions to 41 typical geological problems are presented.

THE STUDY OF ROCKS IN THIN SECTION, by W. W. Moorhouse, 514 pp., 1959, published by Harper & Brothers, 49 East 33 St., New York 16, N.Y. \$8.00.

Four chapters are devoted to general description of optical methods and of minerals. Thirteen chapters deal with igneous rocks, seven with sedimentary rocks and five chapters with metamorphism. The final chapter relates to the petrography of ores. Well illustrated.

GEOLOGIA APPLICATA ALL'INGEGNERIA, by Ardito Desio, Second Edition (Revised) 1058 pp., 1959, published by Ulrico Hoepli, Milan, Italy. 9500 lira.

A reference book relating to engineering and economic geology by Professor Desio, Department of Geology, University of Milan.

PHYSICS OF THE EARTH'S INTERIOR, by Beno Gutenberg, Vol. I of International Geophysics Series, 240 pp., 1959, published by Academic Press Inc., 111 Fifth Ave., New York 3, N.Y. \$8.50.

Discusses gravity, terrestrial magnetism, tectonic processes, the interior of the earth and the history of the earth. Has very good bibliography.

EARTH SCIENCE: THE WORLD WE LIVE IN, Second Edition, by Samuel N. Namowitz and Donald B. Stone, 614 pp., 1960, D. Van Nostrand Co., Inc., Princeton, N.J., \$5.25.

The appearance of this much improved textbook for secondary school earth science is very timely in the light of the current explosive interest in earth science among school systems across the country. The subject matter is completely reorganized and up-dated. The book is very well illustrated and attractively bound with full color photographs on the cover. There are six units as follows: Unit I, The Earth and Its Land Forms; Unit II, The Earth and Its History; Unit III, The Earth and the Universe; Unit IV, The Earth and Its Atmosphere; Unit V, The Earth and Its Oceans; Unit VI, The Earth and Its Climates.

ECHOES OF BATS & MEN, by Donald R. Griffin, 156 pp., 1959, Science Study Series, S4. \$0.95.

HOW OLD IS THE EARTH, by Patrick M. Hurley, 160 pp., 1959, Science Study Series, S5. \$0.95.

CRYSTALS AND CRYSTAL GROWING, by A. Holden and Phyllis Singer, 320 pp., 1960, Science Study Series, S7. \$1.45.

WAVES AND THE EAR, by W. A. van Bergeijk, J. R. Pierce and E. E. David, Jr., 235 pp., 1960, Science Study Series, S9. \$0.95.

Above are selected titles with varying coverage of geological subject matter from the paper-back science study series published for students and the general public by Anchor Books, Doubleday & Co. Inc. to stimulate interest in basic science. Also available in hard-back at a slightly higher price.

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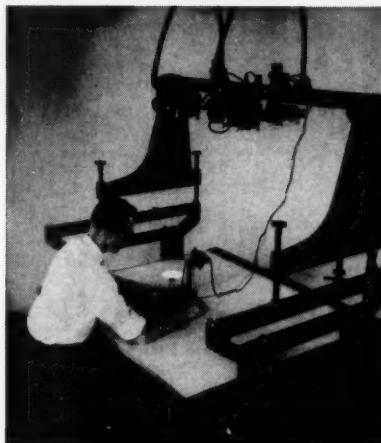
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BRIMSTONE: THE STONE THAT BURNS, 2d Edit., by William Haynes, 308 pp., 1959, published by D. Van Nostrand Co. Inc., Princeton, N.J. \$5.95.

An accomplished writer on various chemical topics writes the interesting story of the sulphur industry in a popular but authoritative style.

PROCEEDINGS of IGU REGIONAL CONFERENCE in JAPAN 1957, 606 pp., 1959, published by the Organizing Committee of IGU Regional Conference in Japan, The Science Council of Japan, Tokyo, 1959.

Primarily a collection of papers on geography.

GEOPHYSICAL SURVEYS in MINING, HYDROLOGICAL AND ENGINEERING PROJECTS, published by European Association of Exploration Geophysics supported by Society of Exploration Geophysicists, 270 pp., 1958. \$4.50 (\$3.25 to members of EAEG & SEGp).

Contains thirteen chapters relating to geophysics in mining surveys, three chapters in hydrology and five in engineering compiled by European authorities under the chairmanship of E. H. Hedström. All papers are in English.

SCIENCE and RESOURCES, Edited by Henry Jarrett, 250 pp., 1959, published by the Johns Hopkins Press, Homewood, Baltimore 18, Md. \$5.00.

Based on a series of public lectures on the relation of science to natural resources including a section on exploring for minerals with contributions by John A. S. Adams, James Boyd and Paul W. McGann.

New Zealand Newsletter

From the *Newsletter of the Geological Society of New Zealand* we quote, "Many overseas members have joined (the Society) this year, mainly following publication of an article "Geology Down Under" by B. W. Collinson in *GEO TIMES* (vol. III, no. 1; July-Aug. 1958)." The Society has over 250 members, of which about 50 are overseas members.

The Society was founded in May 1955 and is open to all interested in the earth sciences. Its objectives are to foster earth science investigations and to serve as a medium for the expression of views of New Zealand geologists. The Newsletter is published at irregular intervals. Annual membership is 2/6d per year. The address is: *New Zealand Geological Society c/o New Zealand Geological Survey, P.O. Box 368, Lower Hutt, N.Z.*



ROCK CHIPS

by SANDSTONE SAM

In the classroom—"There is no evidence that the area has been vulcanized."

• • •
Expert—ex (has been) spurt (a drip under pressure).

• • •
From the AGI mail bag: Mr. G. O. Science abstracts, American Geological Institute, Washington, D. C.

• • •
An oasis is a fertile bit in the desert.

• • •
Then there was the bald uranium-hunting geologist who claimed he was the victim of radio-active fall-out.

Lake Superior Institute

The Department of Geology of the University of Wisconsin and the State Geological Survey will serve as hosts to the sixth annual meeting of the Lake Superior Institute of Geology in the Wisconsin Center on the campus of the University, Madison, Wisconsin, April 14-15. The technical sessions will emphasize Precambrian Geology. No field trips are planned.

For further information on the program and housing write Prof. E. N. Cameron, Science Hall, University of Wisconsin, Madison.

AAPG Matson Award

The AAPG Matson Award is given each year to the speaker for the best presentation of a technical paper at the annual meeting of the Association. The basis for judging the talk is organization (20%), presentation (60%), and visual aids (20%). The scientific merit of the paper is not a factor in the judging.

It has been announced by A. R. Denison, Chairman of the Matson Award Committee that the fourth annual award winner will be selected from among those presenting papers at the Atlantic City meeting, April 25-28. Dr. Daniel A. Busch, winner of last year's Matson Award, will be presented the award during this year's meeting.



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EDITOR'S NOTE: This is not a paid advertisement, but is submitted by friends (?) of this manufacturer of various geo-elixirs. The bottle was found empty at Wallingford, Conn. in 1859.

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GRADUATE ASSISTANT wanted immediately to join small team doing research in high pressure chemistry including geochemistry. Appointment for one year with possibility of extension and of getting higher degree. Will also consider now applicants for similar position to start next fall. Dr. R. S. Bradley, Department of Inorganic & Structural Chemistry, University, Leeds 2, England.

TEACHING POSITION—Rank (Asst. Prof.). Master's Degree in geol., geophysics, or engineering geology; broad background in physics. Two-man department, 12 hr. course load. Recent or June graduate acceptable. Complete academic and biographical data to Wiley S. Rogers, Head, Dept. of Geology, Birmingham-Southern College, B'ham, Ala.

UNIVERSITY OF WESTERN ONTARIO—London, Canada. Applications are invited for National Research Council of Canada and other Post-Doctoral Fellowships tenable in the Department of Geophysics, 1960-62. Facilities are available for research in the fields of rock magnetism, terrestrial heat flow, seismology, gamma-ray and neutron scattering, geophysical prospecting and operations research. Applications are also invited from prospective candidates for Graduate Fellowships, Scholarships and Teaching Assistantships tenable at U. W. O. in geophysics.

Address inquiries as to stipends, tax exemption, travel allowances, accommodation and application procedures to Robert J. Utten, Department of Geophysics.

WANTED: PROJECT ENGINEER. Physicist or Geophysicist with seismic and sub-surface experience. Underwater acoustics experience very desirable. Important long-term projects in underwater communications. Applicant must have ability to provide technical direction and effective group management. Engineer and Junior Engineer staff positions also available to qualified personnel. Send resume to Mr. Virgil D. Hylton, Aerojet-General Corporation, P.O. Box 460, Frederick, Maryland.

DEPARTMENT OF GEOLOGY, University of Alberta at Calgary, invites applications for appointment as Assistant Professor from geologists who have completed their doctorate, preferably with specialization in stratigraphy-paleontology or structural geology-geomorphology-photogeology. A new building offers good research facilities in a small department in the Canadian center of the oil industry. Initial salary \$6000-7000 (8-month basis). Applications should be accompanied by a curriculum vitae and two letters of recommendation, and addressed to Chairman, Department of Geology, University of Alberta, Edmonton.

UNIVERSITY OF ALASKA, College, Alaska. Opening September, 1960, for Ph.D., to teach paleontology and stratigraphy on undergraduate and graduate level in young, growing department of an expanding State University. Research encouraged. Assistant or Associate Professor depending upon qualifications. \$900.00 per month minimum salary for eight and one-half months academic year for Assistant, and \$1000.00 for Associate. Man preferably under

40; would also consider outstanding senior man seeking sabbatical-year post. Apply with complete credentials to Head, Dept. of Geology, University of Alaska.

UNIVERSITY OF ALASKA, College, Alaska. Opening September, 1960, for Ph.D. to teach mineral deposits and allied courses on undergraduate and graduate level in young, growing department of an expanding State University. Research encouraged. Assistant or Associate Professor depending upon qualifications. \$900.00 per month minimum salary for eight and one-half months academic year for Assistant, and \$1000.00 for Associate. Man preferably under 40; would also consider outstanding senior man seeking sabbatical-year post. Apply with complete credentials to Head, Dept. of Geology, University of Alaska.

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POSITIONS WANTED

BOX 611. ASSISTANT PROFESSOR, Ph.D. major university wishes to teach in college or university in more desirable area. 3 yrs. teaching and 6 yrs. varied industrial experience. Primarily interested marine geology, paleontology, sedimentation, mineralogy. Active researcher, member prof. societies. Resume on request.

BOX 612. MUSICIAN and composer; full professor; major university; Yale graduate; 13 yrs. teaching experience; former violinist in internationally famous string quartet; Guggenheim Fellow; married; 2 children; wishes to teach in college or university in more desirable area; amateur geologist; would appreciate your bringing this ad to the attention of your Music Department. Resume on request.

BOX 640. PETROLOGIST, 38, Ph.D. '52.

BOX 646. GEOLOGIST, broad exploratory background in the Four Corners, Panhandle and West Texas. Eight years experience includes subsurface, administration and seismograph. Some field and well work. Desires more responsibility.

BOX 647. GEOLOGIST, Ph.D., 34, married. Desires permanent teaching position in small to moderate size school and town preferably in south or west. Broad geological background in teaching and research, especially in sedimentary rocks, principles of stratigraphy, petroleum geology, and mineralogy. 2½ years experience with major oil company.

BOX 655. GEOLOGIST, Ph.D., 35, on sabbatical leave beginning February or June, 1960. Available for project work of any type, preferably foreign. Broad scientific background and diversified practical experience, especially within the mineral industry. Works well with people and enjoys all phases of the profession.

BOX 658. RETIRING DEPARTMENT CHAIRMAN with 30 years of successful teaching in eastern men's college is interested in 1 semester or 1 year appointments beginning September 1960 as visiting professor or lecturer. Especially interested in courses in regional geomorphology and geology of U.S. and history of geological science.

BOX 668. PALEONTOLOGIST, M.S., in geology. Family. 7 years experience in California, 1 year in the Rocky Mountains with the major Oil Companies. Up, Cretaceous and Tertiary foraminifera. Russian, German fluently. Will consider any work.

BOX 669. GEOLOGIST, B.S., 35, single. Eight years experience in petroleum exploration and production. Interest in all phases of earth science. Will consider any change and relocate anywhere.

BOX 670. GEOLOGIST, M.S., Ph.D. work completed, 31, married, veteran, 4 yrs. experience stratigraphic mineral deposits, sedimentology. Desires petroleum work domestic or foreign.

BOX 671. GEOLOGIST, Ph.D., 37, married, 5 years industrial experience, 2 years teaching experience, desires teaching and/or research position. Primary interests: sedimentation, sedimentary petrography, petroleum geology, stratigraphy. Secondary interests: structure, field geology, economic geology.

POSITIONS WANTED—Continued

BOX 673. GEOLOGIST, B.S., 25, family, 2 yrs. U.S. Army, surveying experience. Desires position in exploration or mineralogy and petrology. Prefer Western U.S.

BOX 675. GEOLOGIST, 31, Ph.D., '60, excellent references, background; teaching experience, USGS, major oil company. Desires teaching position, interests in structural geology, sedimentation, mineralogy, economic geology, etc.

BOX 676. PETROLEUM GEOLOGIST-Stratigrapher, 32, M.S., family, 6 yrs. varied exp. U.S., Canada and Foreign with major oil and consulting. Desire position of responsibility in research or exploration. Executive ability, presently chief geologist. Consider any reasonable offer.

BOX 677. GEOLOGIST, Ph.D., 32. Excellent record at well known northeastern universities. Married, 2 children, USGS experience. Publications, best references. Enjoy teaching (5 years experience stratigraphy, paleont., etc.) but willing to consider oil or research openings. Resume on request.

BOX 678. ECONOMIC GEOLOGIST, M.S., 37, desires teaching or mineral industries position, U.S. or foreign. Five years lab and field experience in mineral deposits, ore microscopy, petrography, X-ray and chemical analysis, mapping, core logging; knowledge cement and evaporites; some teaching experience; publications. Graduate work toward Ph.D. Married; resume on request.

GEOLOGIST, 24, single, draft exempt, B.S., geology, University of Texas, June, 1957. Have just completed 2 years with U.S. Army, Sept. 1957 to Sept. 1959. Desires employment in petroleum exploration, preferably Southwest U.S., but is free and willing to travel anywhere. Although experience limited to summer work, Texas oil fields, it is my opinion that I have a high potential in exploration geology, and would consider experience gained above salary. Contact Jack S. Sanders, 624 W. Owings St., Denison, Texas, phone HO-5-2381.

BOX 681. GEOLOGIST, M.S., 39, family, 9 years teaching experience in eastern and midwestern universities. Several summers experience with state geological survey and consultant for private corporations. Chief interests sedimentation, mineralogy and petrology. Will consider either a teaching position or an industrial offer. Available end of summer.

BOX 682. GROUND-WATER Geologist, B.S., 39, family, 5 yrs. Ground-Water Branch, U.S.G.S., 3 yrs. subsurface, major oil co. Desire ground water work in west or southwest.

BOX 683. STRATIGRAPHER-MICROPALEONTOLOGIST, Ph.D., 34. Five years experience in laboratory (paleozoic forams) and general exploration work with a major oil company. Wishes to settle. Interested in teaching or willing to learn and work in any field. Experience and academic qualifications on request.

BOX 684. PETROLOGIST - SEDIMENTOLOGIST, Ph.D., 29, family. Desires permanent teaching position with possibility for research, or research laboratory-major oil co. Training in all phases of petrology and sedimentology, including litho-facies mapping techniques, environmental interpretations, subsurface geology, and statistical analyses. Two years varied experience with a major oil company. Teaching experience. Equivalent of two years field experience. Resume available on request.

BOX 686. STRATIGRAPHER-PALEONTOLOGIST, Ph.D., 33, desires teaching position or challenging position in petroleum industry. 4½ years varied petroleum and 3 years university teaching experience. Resume on request. Employed. Available June 1.

GEOLOGIST, 29, married, desires position in oil company, 3 years field experience as photo-geologist, 1 year as subsurface geologist. Fluent English, French, Spanish. References. Write: A. Orlandoni; B.go Tommasini, 18; Parma, Italy.

BOX 687. MINING GEOLOGIST, Ph.D., level education, registered professional engineer. 11 years diversified experience in exploration and mining, geophysics and geochemistry, and property evaluation. Principal interest is application of modern geological techniques and concepts to ore search. Presently employed. Will relocate east or west.

BOX 688. GEOLOGIST, B.A., 31, married. 5 years experience. Desires position in mining, exploration, or engineering geology. Available on reasonable notice. Resume on request.

BOX 689. PETROLOGIST-GEOCHEMIST, 32, Ph.D. Five years experience in major oil company research laboratory in fields of x-ray and spectrographic analysis, clay mineralogy and geochemistry of sediments. Broad graduate background in geology. Teaching experience in elementary geology, physics, and chemistry at small college. Desires position at college or university, preferably in Rocky Mountain Region. Available in late August, 1960.

BOX 692. GEOLOGIST, Ph.D. expected 1960, 27, single. Desires teaching and research position in university in sedimentary petrology, stratigraphy and sedimentation commencing with the fall term in 1960. Special interests include sandstone petrology, sedimentary structures and paleocurrents. Geological experience includes 6 summers mapping and research in Canada and 1 year in midcontinent. Teaching experience of 3 years at elementary and senior course level.

PHYSICIST, Geophysicist, Engineer, age 33. B.S. Geological Engineering, Univ. Okla., with some graduate work. 44 hrs. mathematics, 44 hrs. geology, 28 hrs. physics, 28 hrs. engineering, 1 yr. seismograph, 3 yrs. radio Op/Tech, 3 yrs. Guided Missile Flight Simulation Research with analog computers, 8 months Satellite Orbital Computations on digital. Capable of working under Ph.D. in theoretical or applied research. Military obligations completed. Min. salary \$28,000 per year, currently employed. Will make application only for research work in Earth Physics, Space Physics, and/or related instrumentation. W. L. Redish, P. O. Box 1334, Wythe Stn., Hampton, Virginia.

BOX 693. GEOLOGIST, M.S., 46. 15 years stratigraphic, structural, subsurface, wellsite, core and surface experience. Publications in U.S., U.K., Australia. Full resume on request. Will travel. Desires position in oil exploration.

GEOREGICAL ENGINEER; Colo. School of Mines graduate, M.S. from Stanford, studying for Ph.D., 24, single, summer field position desired, available June 13-Sept. 22, 1960. Room 10419, Centennial Hall, U. of Minn., Minneapolis 14, Minnesota.

BOX 694. GEOLOGIST, Ph.D. Eastern University 1960—desires teaching position. Teaching experience: 3 years. Courses taught: physical and structural geology; mineralogy; petrology; economic geology; physiography of N. America. Able to teach any elementary geology course and advanced courses in crystallography, petrography and petrology. Field experience—Newfoundland and Maine.

BOX 695. GEOLOGIST - PALEONTOLOGIST, Ph.D., 30, desires teaching position with research opportunity. Background includes experience in several phases of micropaleontology, as well as stratigraphy, sedimentary petrology, and petrography. Prefer to teach courses in paleontology, stratigraphy, historical geology and related subjects.

BOX 696. MICROPALAEONTOLOGIST-ZOOLOGIST, M.S. in zoology, M.S. in geology plus 25 sem. hrs., single. Two years foreign experience well-site and field, five years surveying, two years topo drafting. Interested in biostratigraphy, drafting, illustrating. Will travel. Resume and drawing samples on request.

BOX 697. MINING-ENGINEERING GEOLOGIST. 10 yrs. diversified surface, subsurface experience with metallic and non-metallic mineral deposits, also experienced as Engineering Geologist on flood control projects. Available for domestic or foreign assignments, preferably with progressive American concern. M.A., family, veteran. Resume upon request.

BOX 698. SEDIMENTOLOGIST-GEOMORPHOLOGIST, Ph.D., 27, family. Desires teaching or research position at college or university. Interested in the application of statistics to geological problems. Currently studying on a postdoctoral fellowship in statistics at midwestern university. Available after June.

BOX 699. MINING GEOLOGIST, Ph.D., 36, with family, 12 years experience in mining geology and exploration projects. Major interest in structural geology of ore deposits. Will prefer a position outside the U.S.A. Currently employed, available in June 1960.

BOX 700. GEOLOGIST, 35, 8 years experience, petroleum exploration and exploitation, West and North Texas, Oklahoma. Desires responsible position with active company.

BOX 701. MICROPALAEONTOLOGIST-STRATIGRAPHER, 15 years with a major in California, Venezuela, Cuba. Wants permanent teaching job in college or university, and work toward Ph.D.

BOX 702. MARINE GEOLOGIST-SEDIMENTOLOGIST, Ph.D., 31, family. Desires teaching position, some research. Experience with carbonate and detrital marine sediments, deltaic sedimentation, environmental analysis of sedimentary rocks; trained in marine geology, sedimentation, oceanography; 2½ years experience in research section of major oil company.

BOX 703. GEOLOGIST, Ph.D. (Minn.), 40, with a large and happy family. Eight seasons in varied polar work, mostly in the Canadian Arctic; four years University teaching in Introductory Geology, Geomorphology, Photogeology, Glacial and Pleistocene Geology; and four years University Extension teaching in Physical Geology, Mineralogy, Rock Study, and Glacial and Pleistocene Geology; am currently teaching. Member of various professional societies, Sigma Xi, and Phi Beta Kappa. Desire to teach in N. central, N.E., or S.W. U.S. Available in summer fall, 1960.

BOX 704. MINING GEOLOGIST, M.S., 30, 9 years exploration and mining experience in the Rocky Mountain region. Desires responsible position with growing company. Principal interests include paragenesis of mineral deposits, metamorphic and igneous petrology, and structural geology. Desire permanent base of operations. Married, 2 child., presently employed. Resume on request.

BOX 705. EXPLORATION-PHOTOGEOLOGIST, Drs., 30, Dutch, 6 years experience in Europe, Algeria, South America: mapping, mineral-exploration, photo-geology of tropical rainforest countries, training of geologists. Publications. English, French, German, desire work in exploration, research or teaching anywhere. Excellent references. Presently in South America. Available June '60.

BOX 706. GEOLOGIST-GEOPHYSICIST, 43, Ph.D. '59, extensive US and foreign geophysical experience in interpretation, field procedures, supervision, and reporting. Recent training in petrography, mineralogy, petrology, and photogeology. Good background in optical methods from lab teaching experience and thesis research. Interested in research in above fields, US and foreign, and in technical assistance type projects. Resume on request.

BOX 707. MINERALOGIST-PETROGRAPHER, 26, M.S. desires teaching or research position. Experienced in thin and polished section studies, powder diffraction and single crystal X-ray techniques. Open to any reasonable offer.

BOX 708. ENGINEERING GEOLOGIST, 31, M.S.E.G.; 7 yrs. in Eng. Geol., Geophysics, Hydrology. Presently responsible for Eng. Geol. Reports concerning materials and foundations of civil projects in flood control and water supply, and the inspection and control of private works.

BOX 709. GEOLOGIST, 27, married; Ph.D. (London), 1 year PostDoctoral Research Fellow, N.R.C. Canada; now in 3rd year Assistant Professor in Canadian university, teaching petrology, sedimentology, structural geology. Prime interest metamorphic geology, but would like to develop interest in geochemistry. Desires teaching and research position in September, 1960.

BOX 710. ASSISTANT PROFESSOR, Ph.D. degree imminent from major western university, wishes to teach in college or university. 4 yrs. college teaching and 6 yrs. petroleum industrial experience. Active researcher with publications in Recent sediments, faunas, ecology, and geomorphology. Capable of organizing and conducting research in Recent geology. Primarily interested in paleontology, micropaleontology, sedimentation, ecology, geomorphology, marine and coastal geology. Also educational and teaching background in geography. Resume on request.

BOX 711. COLLEGE PROFESSOR desires industrial research position concerned with Recent geology, i.e., sediments, faunas, ecology, coastal and marine geology. Ph.D. nearly completed. Teaching and petroleum industrial experience with active research in Recent geology. Capable of organizing and conducting research in Recent geology, particularly Gulf Coastal area. Resume on request.

BOX 712. GEOLOGIST, Ph.D. Age 39. Desires teaching position. Experience: 4 yrs. teaching, 2 yrs. state survey in West, 6 yrs. oil company exploration and development in S. America. Presently employed. Prepared to teach sedimentology and marine geology, structure and tectonics. Also petrol. geophysics, stratigraphy, geomorphology and glacial geology.

BOX 713. GEOMORPHOLOGIST-GLACIAL GEOLIST, Ph.D., 36, desires teaching position in midwestern or northeastern college with graduate program, or undergraduate program with research encouraged. In addition, can teach ground water and structural geology. Four years with Ground Water Branch, USGS, five years in teaching, publications. Resume on request.

BOX 714. GEOMORPHOLOGIST, Ph.D. 35. Desires to teach geomorphology and ground water geology in university. Two years experience in U.S. Bureau of Reclamation, seven years in U.S. Geological Survey. Publications.

GEOLIST, AB (Cornell), 24, single, aggressive. Field course experience in New York, South Dakota, and Nebraska. Major undergraduate papers in paleontology, geomorphology, and sedimentology. Four months with U.S. Geological Survey, Geochemistry and Petrology Branch. Associate member of American Geophysical Union. 2/LT. USAR. Aviator. Salary and location open. Contact Chester E. Nichols, 244 Mass Ave., Boston, Mass.

CONSULTANTS

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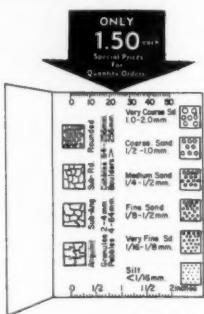
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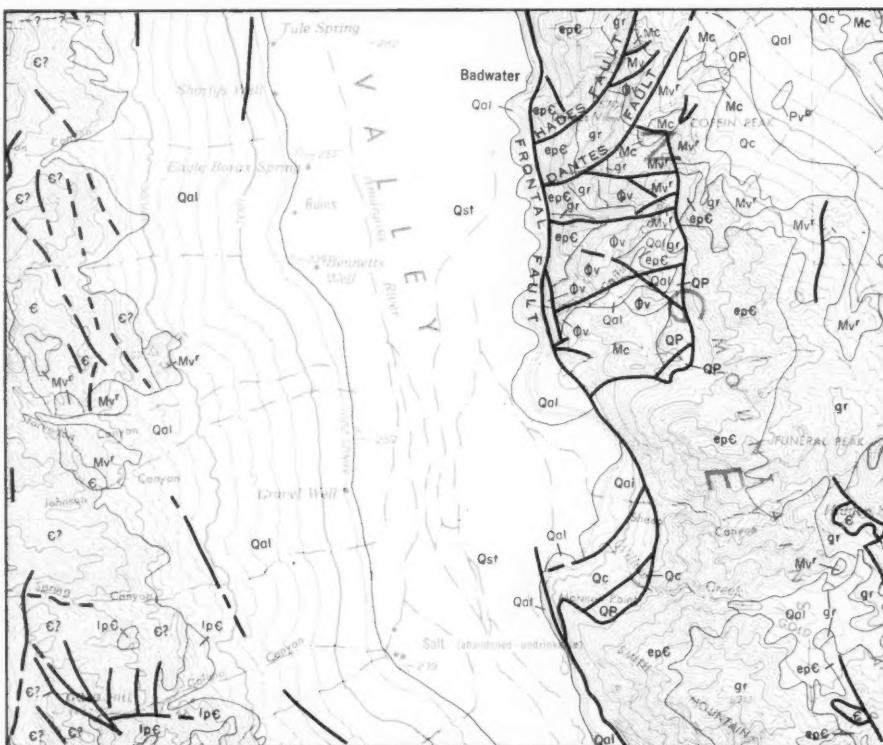
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